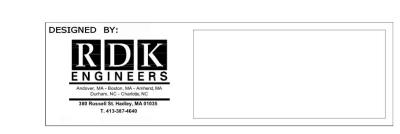
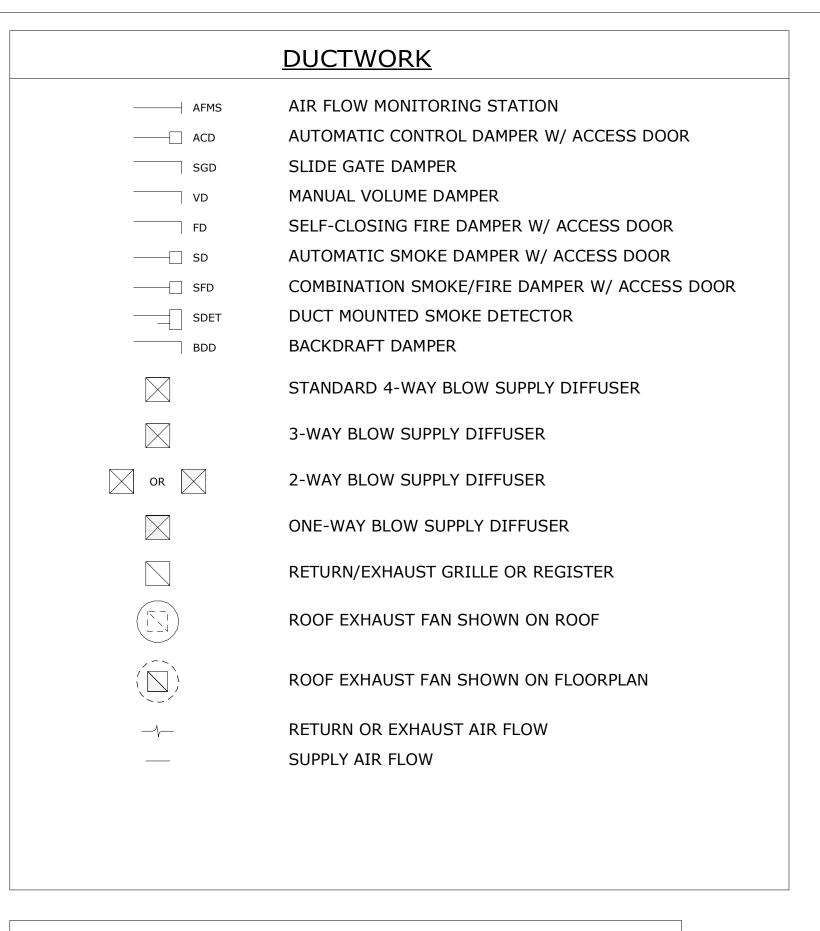
10 - MECHANICAL INDEX OF DRAWINGS

DRAWING NUMBER	DRAWING TITLE	DRAWING NUMBER	DRAWING TITLE
MEC-001	MECHANICAL LIST OF DRAWINGS	MEC-301	MECHANICAL ROOF - PART PLAN A
MEC-002	MECHANICAL LEGEND	MEC-302	MECHANICAL ROOF - PART PLAN B
MEC-003	MECHANICAL LEGEND II	MEC-303	MECHANICAL ROOF - PART PLAN C
MEC-100	MECHANICAL ZONE PLAN	MEC-304	MECHANICAL ROOF - PART PLAN D
MEC-200	OVERALL DUCT PLAN	MEC-305	MECHANICAL ROOF - PART PLAN E
MEC-201	MECHANICAL - PART PLAN A	MEC-306	MECHANICAL ROOF - PART PLAN F
MEC-202	MECHANICAL - PART PLAN B	MEC-307	MECHANICAL ROOF - PART PLAN G
MEC-203	MECHANICAL - PART PLAN C	MEC-500	MECHANICAL CONTROLS I
MEC-204	MECHANICAL - PART PLAN D	MEC-501	MECHANICAL CONTROLS II
MEC-205	MECHANICAL - PART PLAN E & EQUIP. PLATFORM	MEC-502	MECHANICAL CONTROLS III
MEC-206	MECHANICAL - PART PLAN F	MEC-503	MECHANICAL CONTROLS IV
MEC-207	MECHANICAL - PART PLAN G	MEC-600	MECHANICAL DETAILS I
MEC-200P	OVERALL PIPE PLAN	MEC-601	MECHANICAL DETAILS II
MEC-201P	MECHANICAL PIPE - PART PLAN A	MEC-602	MECHANICAL DETAILS III
MEC-202P	MECHANICAL PIPE - PART PLAN B	MEC-603	MECHANICAL DETAILS IV
MEC-203P	MECHANICAL PIPE - PART PLAN C	MEC-604	MECHANICAL DETAILS V
MEC-204P	MECHANICAL PIPE - PART PLAN D	MEC-605	MECHANICAL DETAILS VI
MEC-205P	MECHANICAL PIPE - PART PLAN E & EQUIP. PLATFORM	MEC-700	MECHANICAL SCHEDULES I
MEC-206P	MECHANICAL PIPE - PART PLAN F	MEC-701	MECHANICAL SCHEDULES II
MEC-207P	MECHANICAL PIPE - PART PLAN G		



			THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.	DESIGNER/DRAFTER WJS CHECKED BY: TFC SCALE NTS	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	SIGNATURE/BLOCK: OF COMMEC 28569	PROJECT TITLE	REPAIR FACILITY	ROCKY HILL DRAWING TITLE MECHANICAL LIST OF	PROJECT NO. 118-0167 DRAWING NO. MEC-001 SHEET NO.
NO.	Revision Description	Date	Plotted: 10/10/2014 1:53:00 PM		File Name: C:\Users\HMarshall\Documents\ARCH_CT DOT_Rocky Hill Repair Facility_Central_HMarshall.rvt	1011-Ellen			DRAWINGS	10.01

Section Sect		PIPING LEGEND			DUCT	<u>WORK</u>		
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PIPE CONNECTION - TOP PIPE CONNECTION - BOTTOM PIPE - DOWN PIPE - UP REDUCER - CONCENTRIC REDUCER - ECCENTRIC CLEANOUT FOR CONDENSATE DRAIN DIRT LEG RISE (DOUBLE LINE - PLAN VIEW) PIPE BREAK (DOUBLE LINE) DIRT LEG PIPE CONNECTION - TOP PIPE CONNECTION - BOTTOM DIFFUSER/GRILLE VO D	X					<u> </u>	KLGI31LK/GKILLL	
PIPE CONNECTION - BOTTOM PIPE - DOWN PIPE - UP REDUCER - CONCENTRIC REDUCER - ECCENTRIC CLEANOUT FOR CONDENSATE DRAIN DIRT LEG RISE (DOUBLE LINE - PLAN VIEW) PIPE BREAK (DOUBLE LINE - PLAN VIEW) DIFFUSER/GRILLE DIFFUSER/GRILLE VD VD VD VD VD VD VD VD VD V				TAKE OFF TO	<u> </u>)		<u> </u>
PIPE CONNECTION - BOTTOM PIPE - DOWN PIPE - DOWN PIPE - UP REDUCER - CONCENTRIC REDUCER - ECCENTRIC CLEANOUT FOR CONDENSATE DRAIN DIRTURG RISE (DOUBLE LINE - PLAN VIEW) PIPE BOWN DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) DIFFUSER (W) SHEETMETAL PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR PLENUM, LIN			L				SUPPLY SIDEWALL LINEAR	
REDUCER - CONCENTRIC REDUCER - ECCENTRIC CLEANOUT FOR CONDENSATE DRAIN DIRT LEG RISE (DOUBLE LINE - PLAN VIEW) PIPE BREAK (DOUBLE LINE) CONTRICT OF CONCENTRIC CLEANOUT FOR CONDENSATE DRAIN CONTRICT OF CONTR				H		VD - VD	DIFFUSER (W/ SHEETMETAL	
REDUCER - CONCENTRIC REDUCER - ECCENTRIC CLEANOUT FOR CONDENSATE DRAIN DIRT LEG RISE (DOUBLE LINE - PLAN VIEW) DROP (DOUBLE LINE - PLAN VIEW) PIPE BREAK (DOUBLE LINE) CEILING DUCT MOUNTED DIFFUSER/GRILLE SUPPLY CEILING LINEAR DIFFUSER (W/SHEETMETAL PLAN VIEW) ACOUSTICALLY LINED DUCT DIFFUSER/GRILLE SUPPLY CEILING LINEAR DIFFUSER (W/SHEETMETAL PLAN VIIING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) OPEN END DUCT W/ 1/2"x1/2" WMS								IVD
REDUCER - ECCENTRIC CLEANOUT FOR CONDENSATE DRAIN DIRT LEG RISE (DOUBLE LINE - PLAN VIEW) DROP (DOUBLE LINE - PLAN VIEW) PIPE BREAK (DOUBLE LINE) REDUCER - ECCENTRIC DIFFUSER/GRILLE DIF	0						LINEAR.)	
CLEANOUT FOR CONDENSATE DRAIN DIFFUSER (W/SHEETMETAL PLANVINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) RISE (DOUBLE LINE - PLAN VIEW) DROP (DOUBLE LINE - PLAN VIEW) PIPE BREAK (DOUBLE LINE) DIFFUSER (W/SHEETMETAL PLANVINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) PLENUM, LINING & BRANCH CONN. FOR EVERY 4' OF LINEAR.) PIPE BREAK (DOUBLE LINE - PLAN VIEW) PIPE BREAK (DOUBLE LINE)			4		ZZI VD		SUPPLY CEILING LINEAR	
DIRT LEG RISE (DOUBLE LINE - PLAN VIEW) DROP (DOUBLE LINE - PLAN VIEW) PIPE BREAK (DOUBLE LINE) ACOUSTICALLY LINED DUCT FLEXIBLE DUCT OPEN END DUCT W/ 1/2"x1/2" WMS			ν - - ' - '	DII I OSLKY GRILLL	PV	VD - VD	DIFFUSER (W/SHEETMETAL	
DIRT LEG RISE (DOUBLE LINE - PLAN VIEW) DROP (DOUBLE LINE - PLAN VIEW) PIPE BREAK (DOUBLE LINE) LINEAR.) PLEN BY LI OPEN END DUCT OPEN END DUCT W/ 1/2"x1/2" WMS	СО	CLEANOUT FOR CONDENSATE DRAIN	,	ACOUSTICALLY LINED			•	VD
RISE (DOUBLE LINE - PLAN VIEW) DROP (DOUBLE LINE - PLAN VIEW) PIPE BREAK (DOUBLE LINE) PIPE BREAK (DOUBLE LINE)		DIRTLEG	>					
OPEN END DUCT W/ 1/2"x1/2" WMS PIPE BREAK (DOUBLE LINE)	<u></u>		, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					← PLEN BY LI
DROP (DOUBLE LINE - PLAN VIEW) PIPE BREAK (DOUBLE LINE)		RISE (DOUBLE LINE - PLAN VIEW)	\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	FLEXIBLE DUCT	كاللللللم		OPEN FND DIICT W/	
		DROP (DOUBLE LINE - PLAN VIEW)						
	_	PIPE BREAK (DOUBLE LINE)				<u> </u>		
	<u> </u>	PIPE BREAK (SINGLE LINE)						



PIPING ABBREVIATIONS

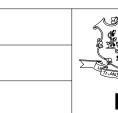
--- HOT WATER RETURN HOT WATER SUPPLY MAKE-UP WATER PC ---- PUMPED CONDENSATE

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	THE INFORMATION, INCLUDING ESTI QUANTITIES OF WORK, SHOWN ON T SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IN NO WAY WARRANTED TO INDICAT THE CONDITIONS OF ACTUAL QUANT OF WORK WHICH WILL BE REQUIRED
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Revision Description

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Plotted: 10/21/2014 3:29:22 PM



1/8" = 1'-0"





DOUBLE LINE

REPAIR FACILITY

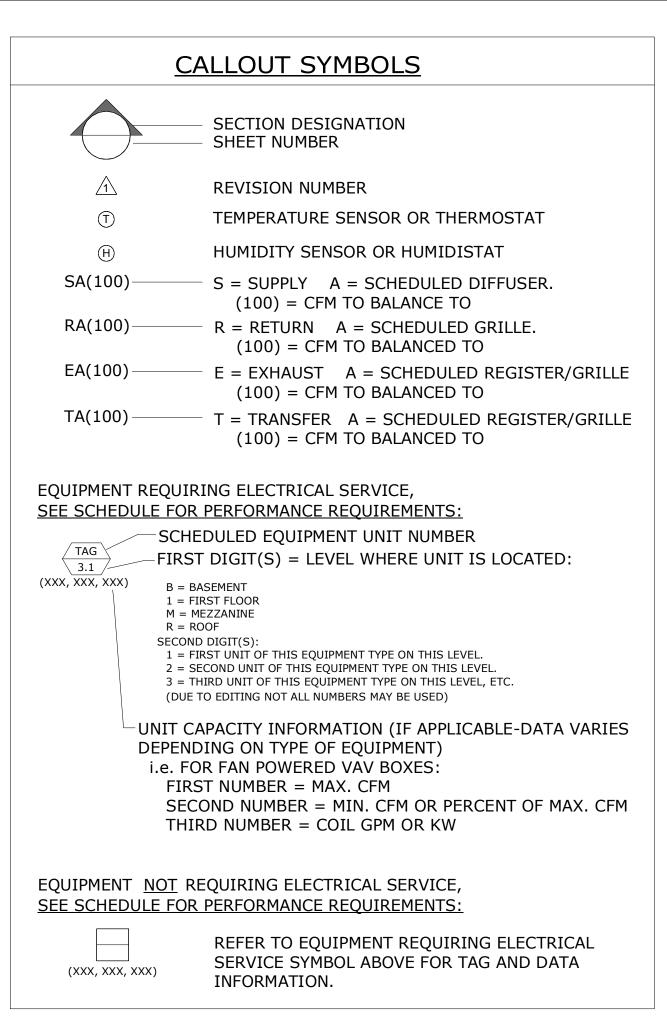
ROCKY HILL

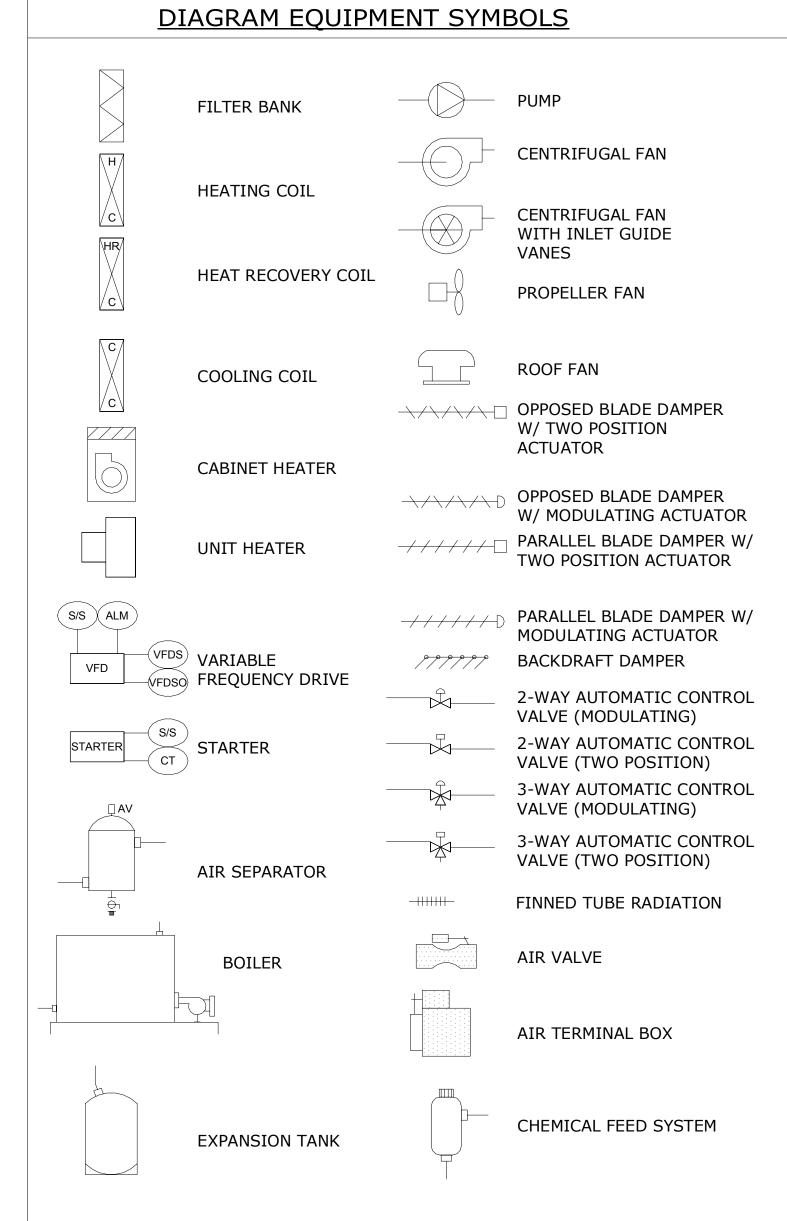
DRAWING NO.

MECHANICAL LEGEND

MEC-002 10.02

PROJECT NO. **118-0167**





ACD AUTOMATIC CONTROL DAMPER ACV AUTOMATIC CONTROL VALVE AFMS AIR FLOW MEASURING STATION ALARM AUTOMATIC TEMPERATURE CONTROL BASEBOARD CONTROL VALVE BACKDRAFT DAMPER (ADJUSTABLE COUNTERWEIGHT) BYPASS VALVE CARBON DIOXIDE SENSOR CAPACITY CONTROL CARBON MONOXIDE SENSOR CURRENT TRANSFORMER (STATUS FEEDBACK) COOLING COIL CONTROL VALVE DISCHARGE AIR TEMPERATURE SENSOR DIRECT DIGITAL CONTROL DDCFP DIRECT DIGITAL CONTROL FIELD PANEL DEMAND LIMIT DIFFERENTIAL PRESSURE SWITCH DIFFERENTIAL PRESSURE SENSOR/TRANSMITTER DIFFERENTIAL PRESSURE BYPASS VALVE DISCHARGE STATIC PRESSURE SENSOR DWDI DOUBLE WIDTH DOUBLE INLET EXHAUST AIR DAMPER EXHAUST CONTROL DAMPER EHRET EXHAUST HEAT RECOVERY COIL ENTERING AIR TEMPERATURE SENSOR EHRLT EXHAUST HEAT RECOVERY COIL LEAVING AIR TEMPERATURE SENSOR EHRV EXHAUST HEAT RECOVERY COIL CONTROL VALVE ES END SWITCH FΑ FAULT ALARM FAN ISOLATION DAMPER FLOW METER/TRANSMITTER FLOW SWITCH FREEZESTAT GENERAL EXHAUST DAMPER HEATING COIL LEAVING AIR TEMPERATURE SENSOR HGB HOT GAS BYPASS HIGH HUMIDITY LIMIT SENSOR HIGH/LOW HUMIDITY LIMIT SENSOR HANDS-OFF AUTOMATIC SWITCH HEAT RECOVERY COIL ENTERING AIR TEMPERATURE SENSOR HEAT RECOVERY COIL LEAVING AIR TEMPERATURE SENSOR **HRLT** HEAT RECOVERY LOOP TEMPERATURE SENSOR HEAT RECOVERY COIL CONTROL VALVE HRCV HRV HEAT RECOVERY LOOP CONTROL VALVE HS HAND SWITCH HSPS HIGH STATIC PRESSURE SWITCH HEATING COIL CONTROL VALVE HWRT HOT WATER RETURN TEMPERATURE SENSOR HWST HOT WATER SUPPLY TEMPERATURE SENSOR INTEGRAL FACE & BYPASS DAMPER INLET GUIDE VANES LEAVING AIR TEMPERATURE SENSOR LOW STATIC PRESSURE SWITCH LEVEL SENSOR OR LIGHT SWITCH INTERFACE LEVEL SENSOR HIGH ALARM LEVEL SENSOR HIGH SWITCH LEVEL SENSOR LOW ALARM LEVEL SENSOR LOW SWITCH MAT MIXED AIR TEMPERATURE SENSOR MAIN EXHAUST DAMPER MUWV MAKE-UP WATER VALVE NORMALLY CLOSED (ON LOSS OF POWER) NORMALLY OPEN (ON LOSS OF POWER) OUTSIDE AIR DAMPER OUTSIDE AIR HUMIDITY SENSOR (FOR WET BULB READING) OUTSIDE AIR TEMPERATURE SENSOR (DRY BULB) OPPOSING BLADE DAMPER PRIMARY AIR DAMPER PRESSURE SENSOR (ROOM) RETURN AIR DAMPER RETURN AIR HUMIDITY SENSOR RETURN AIR TEMPERATURE SENSOR REHEAT CONTROL VALVE RELATIVE HUMIDITY **RUN INDICATOR** SUPPLY AIR DAMPER SMOKE DAMPER SMOKE DETECTOR SMOKE/FIRE DETECTOR STATIC PRESSURE SENSOR SPEED CONTROL START/STOP START/STOP HIGH SPEED/CAPACITY START/STOP LOW SPEED/CAPACITY SUPPLY SMOKE ISOLATION DAMPER SUCTION STATIC PRESSURE SENSOR TEMPERATURE SENSOR/THERMOSTAT TEMPERATURE SENSOR/THERMOSTAT (ROOM) VEHICLE EXHAUST DAMPER VARIABLE FREQUENCY DRIVE SPEED VARIABLE FREQUENCY DRIVE SPEED OUTPUT (FEEDBACK) VOLUME DAMPER **VIBRATION SWITCH** WC WATER COLUMN

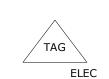
CONTROL ABBREVIATIONS

CONTROL POINT DESCRIPTOR LEGEND

ATC CONTRACTOR

TAG

ATC CONTRACTOR PROVIDED DDC POINT AND HARDWARE



CONTROL DEVICE FURNISHED BY ELECTRICAL OR PLUMBING CONTRACTOR BUT INTERFACED TO DDC SYSTEM BY

PLBG TAG

ATC CONTRACTOR INTERFACE TO **EOUIPMENT MANUFACTURER'S HARDWARE**



ATC CONTRACTOR PROVIDED LOCAL CONTROL POINT

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Revision Description

DESIGNER/DRAFTER TFC 1/8" = 1'-0"

Plotted: 10/21/2014 3:29:23 PM



STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION File Name: MPFP_CTDOT_Rocky Hill Repair Facility_Central.rvt



REPAIR FACILITY

DRAWING TITLE

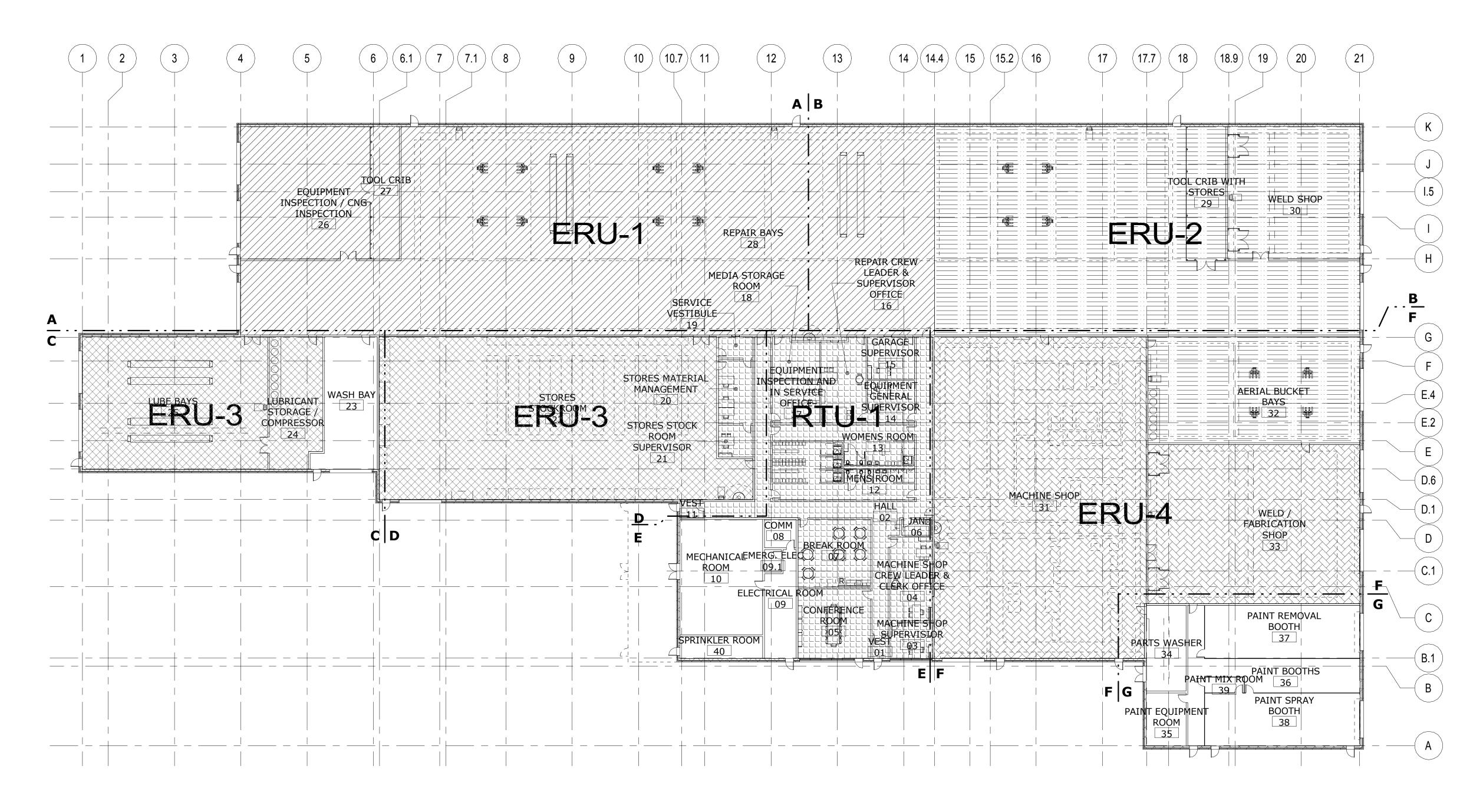
ROCKY HILL

MECHANICAL LEGEND II

DRAWING NO. **MEC-003** 10.03

118-0167

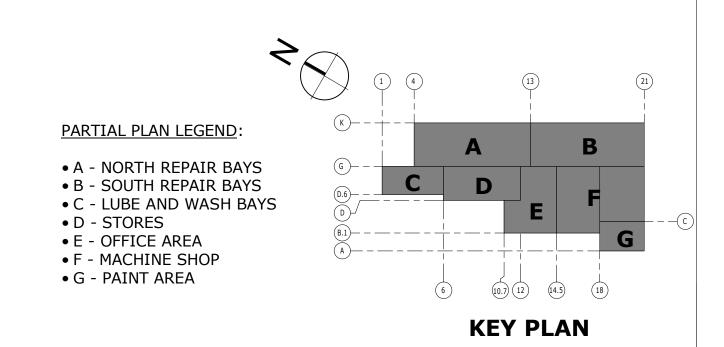
PROJECT NO.



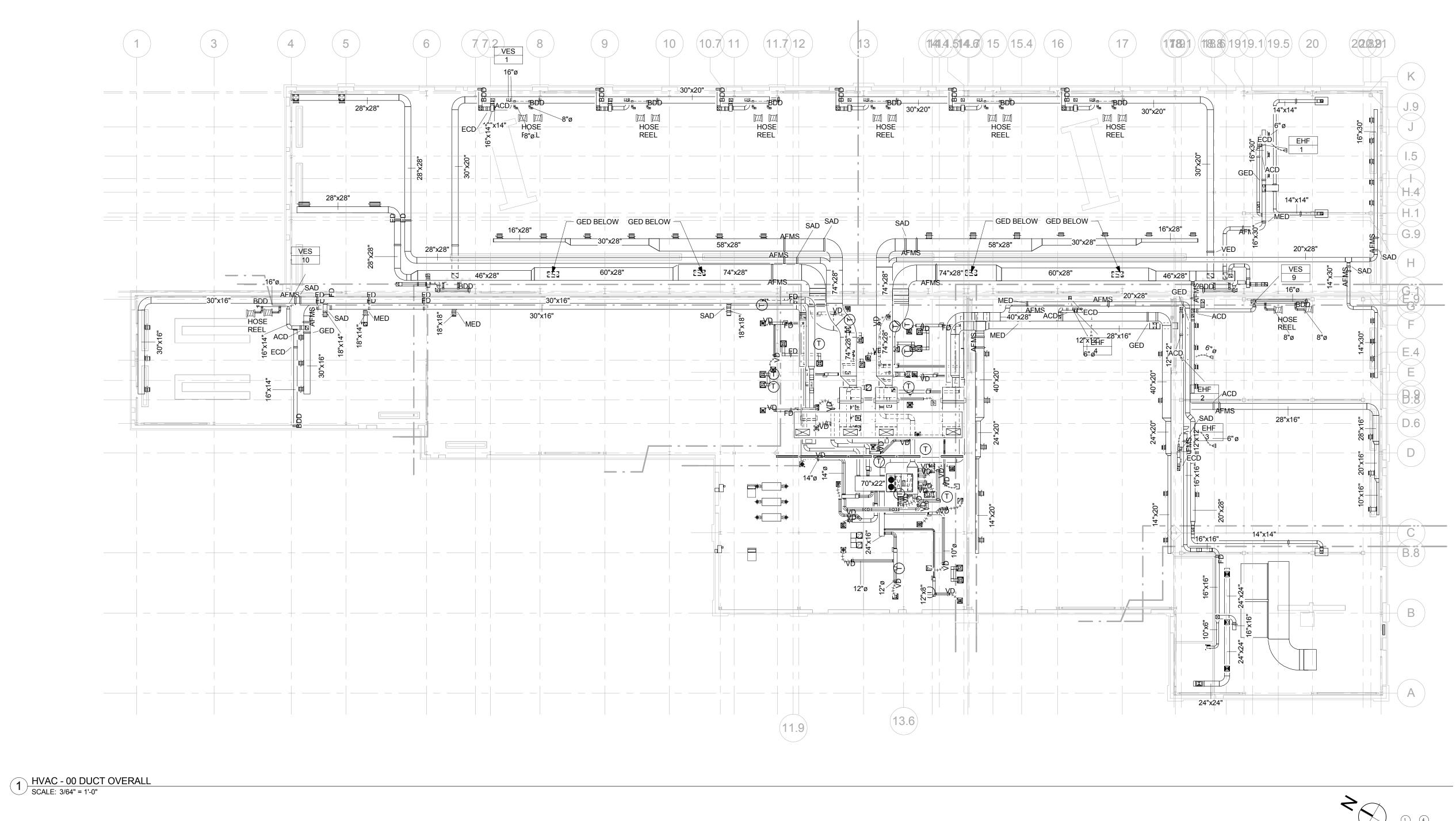
MECHANICAL ZONE PLAN
SCALE: 3/64" = 1'-0"

NOTE:

1) ALL ELECTRICAL IN ROOM 26 & 27 SHALL BE IN COMPLIANCE WITH NFPA 52. ALL ELECTRICAL SHALL BE NFPA CLASS I DIV. 2 GROUP D.



			THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE	DESIGNER/DRAFTER WJS CHECKED BY:	CONNECTION E	SIGNATURE/BLOCK:	PROJECT TITLE		ROCKY HILL	PROJECT NO. 118-0167
			INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.	TFC SCALE	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	28569 X	28569 20 VS	REPAIR FACILITY	DRAWING TITLE	MEC-100
NO.	Revision Description	Date	Plotted: 10/21/2014 3:29:27 PM	3/64" = 1'-0"	File Name: MPFP_CTDOT_Rocky Hill Repair Facility_Central.rvt	70	Many		MECHANICAL ZONE PLAN	10.04

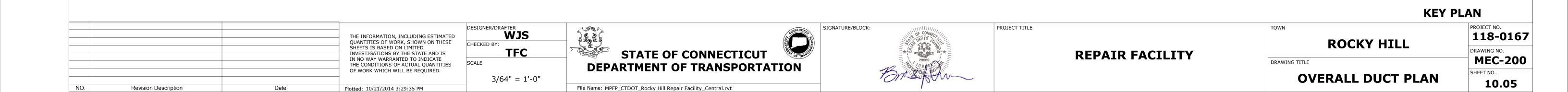


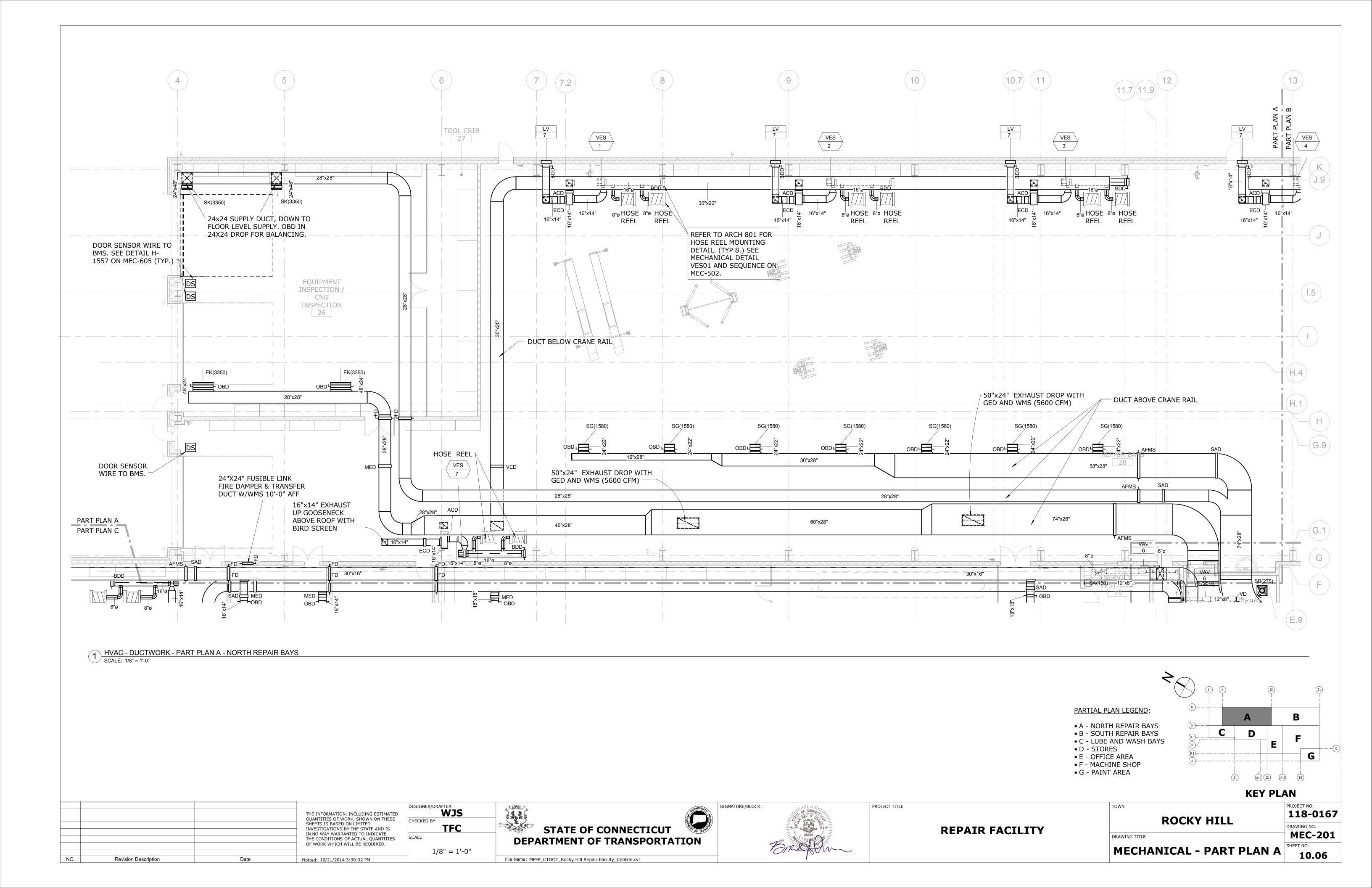
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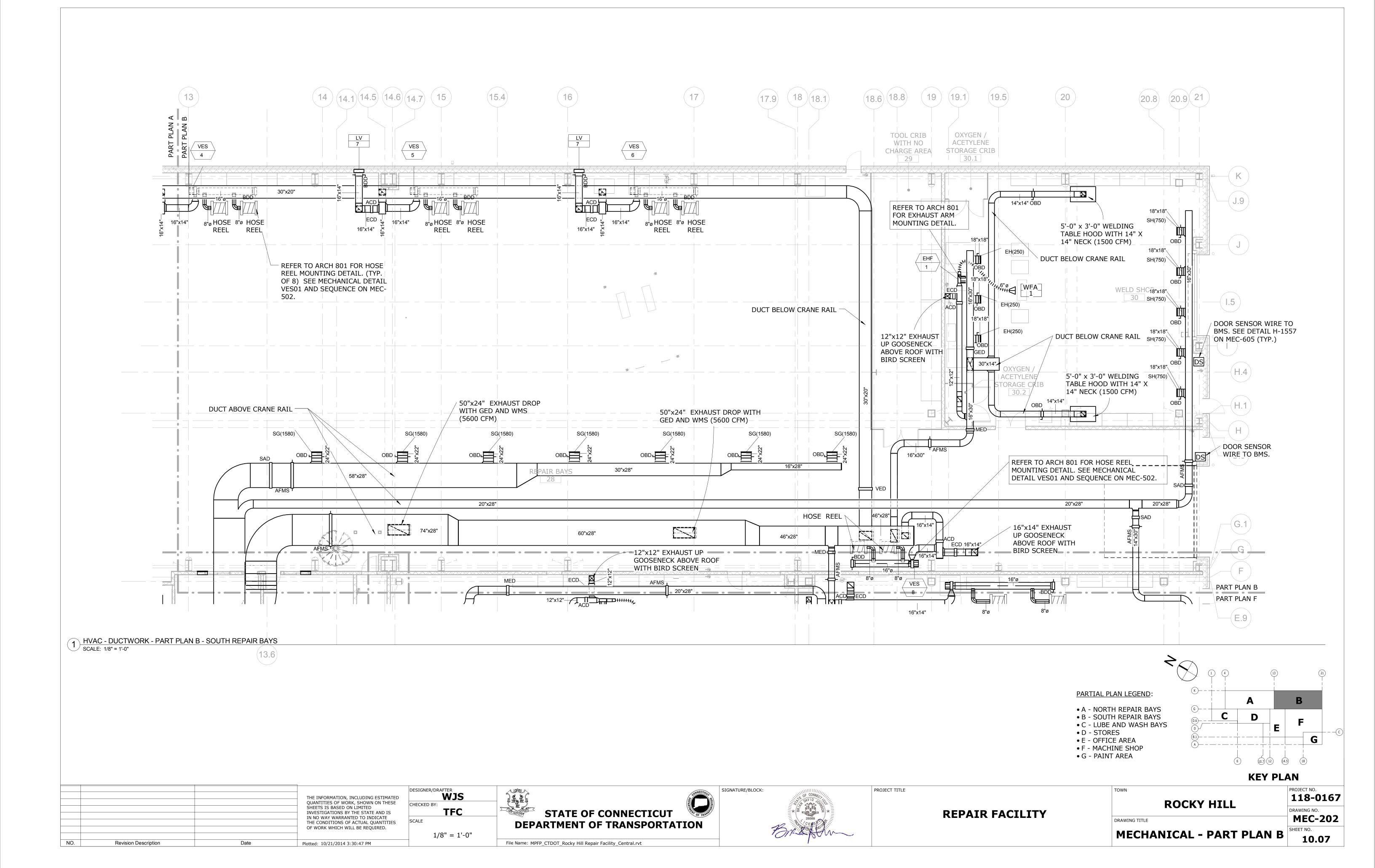
• D - STORES • E - OFFICE AREA • F - MACHINE SHOP • G - PAINT AREA

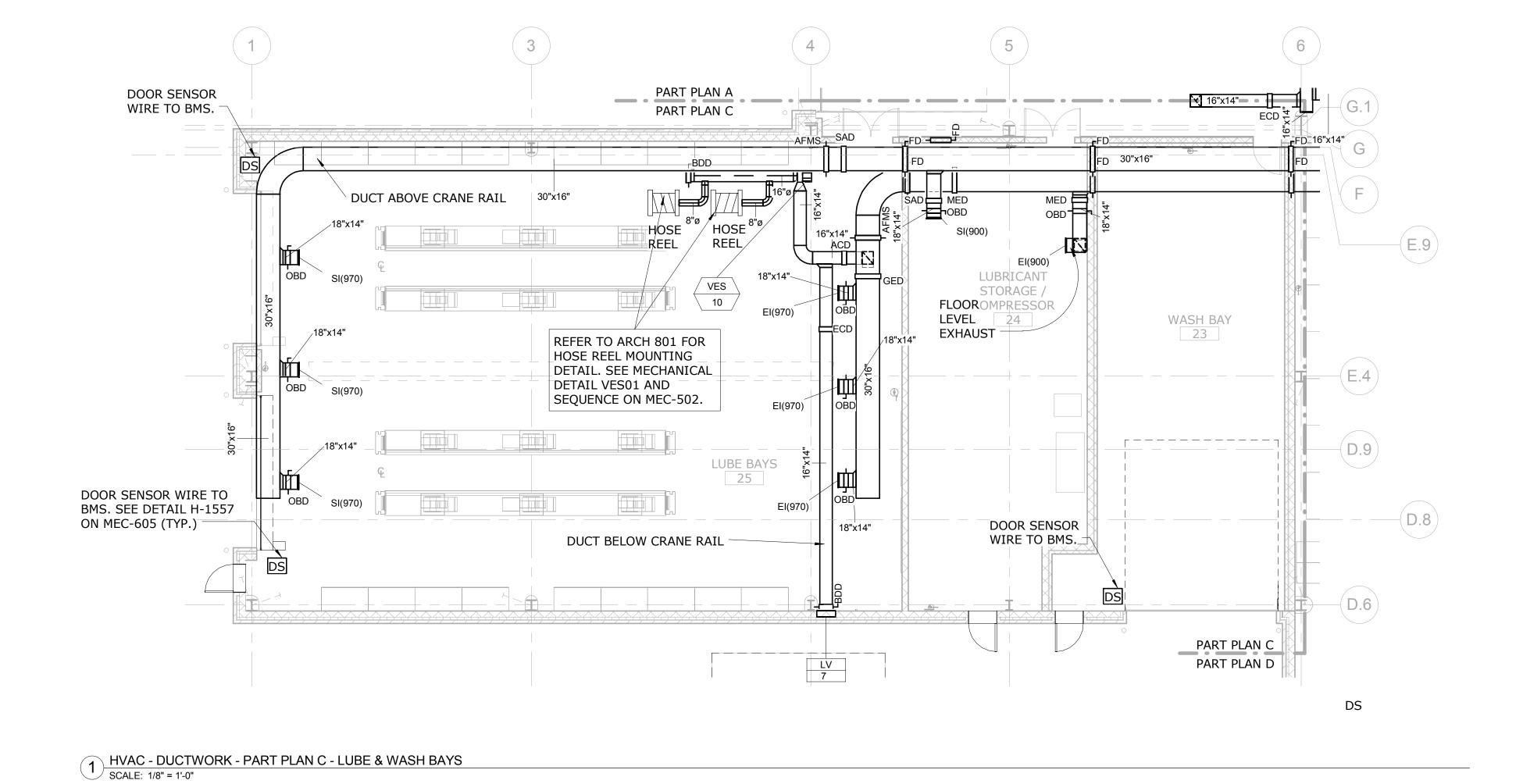
• A - NORTH REPAIR BAYS • B - SOUTH REPAIR BAYS • C - LUBE AND WASH BAYS

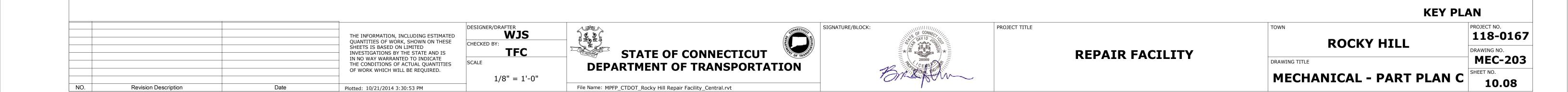
SCALE: 3/64" = 1'-0"











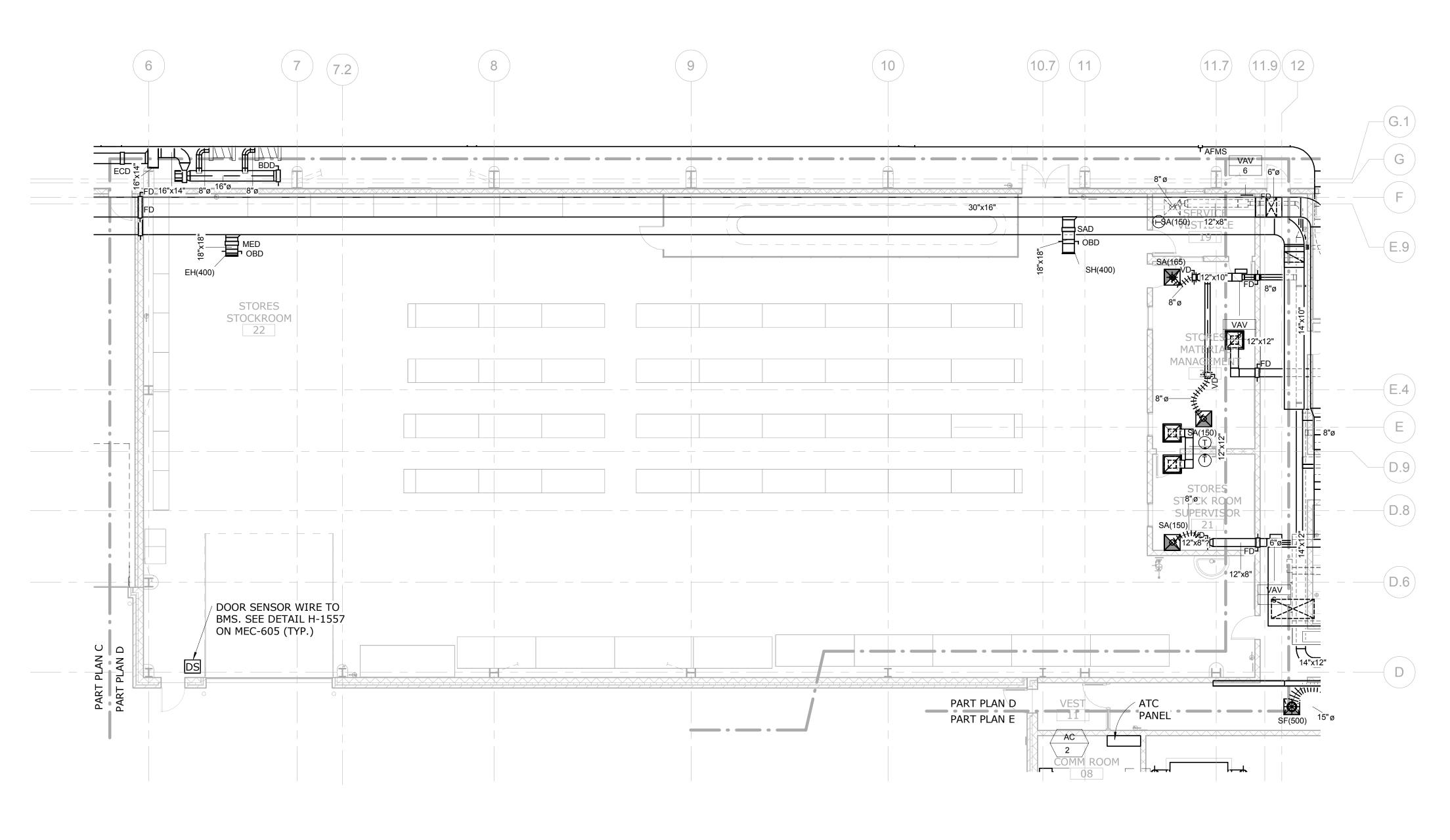
PARTIAL PLAN LEGEND:

• E - OFFICE AREA • F - MACHINE SHOP • G - PAINT AREA

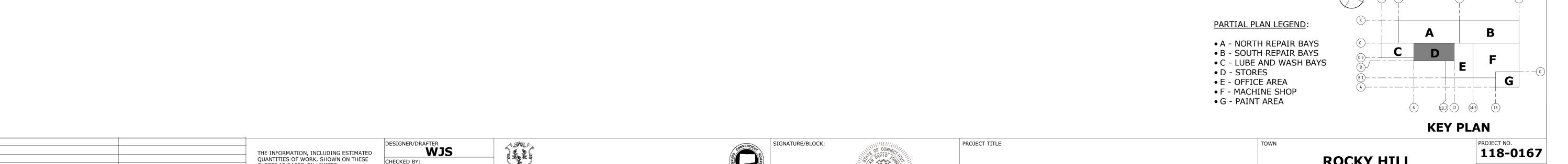
A - NORTH REPAIR BAYSB - SOUTH REPAIR BAYS

C - LUBE AND WASH BAYSD - STORES

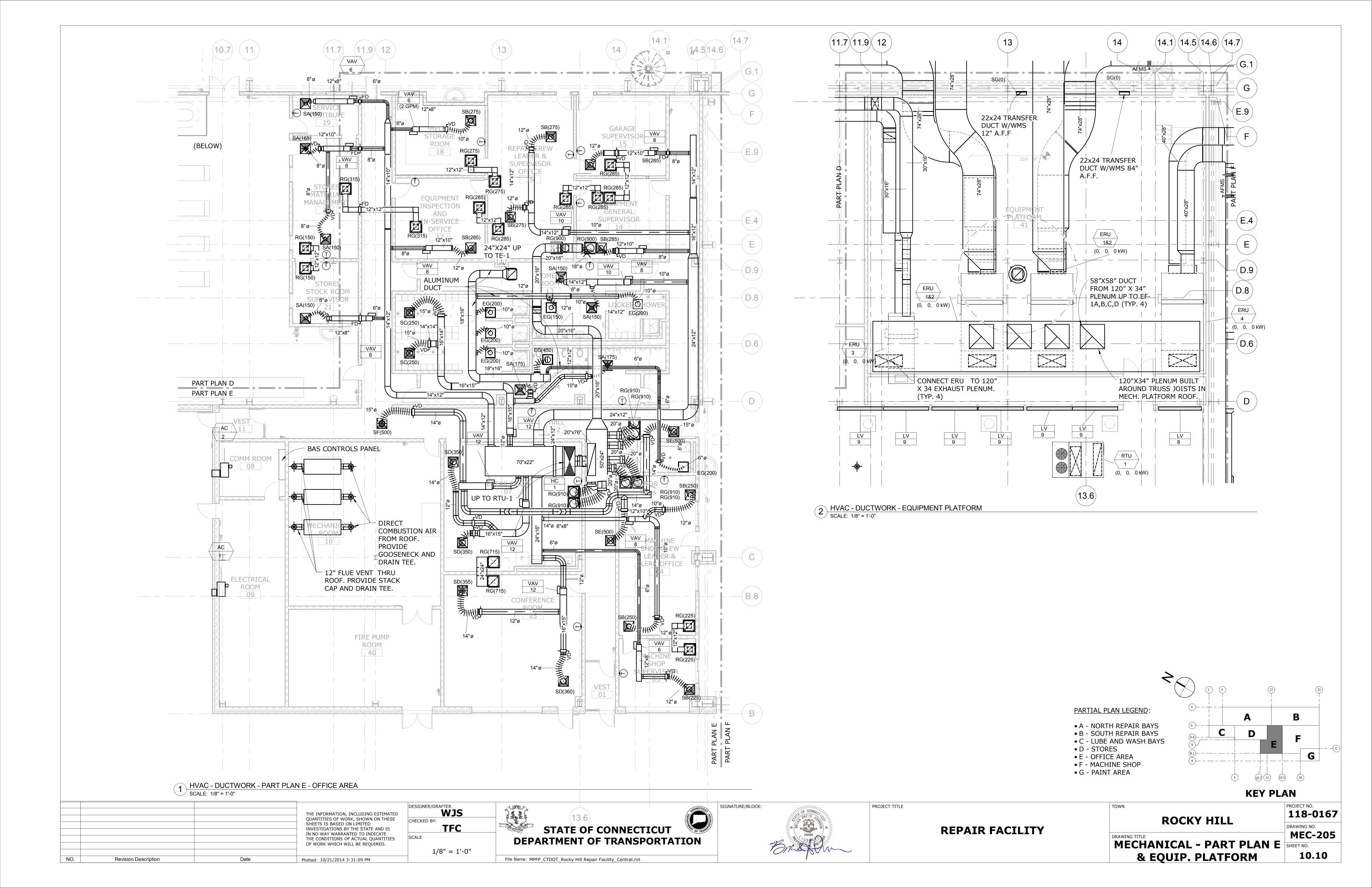
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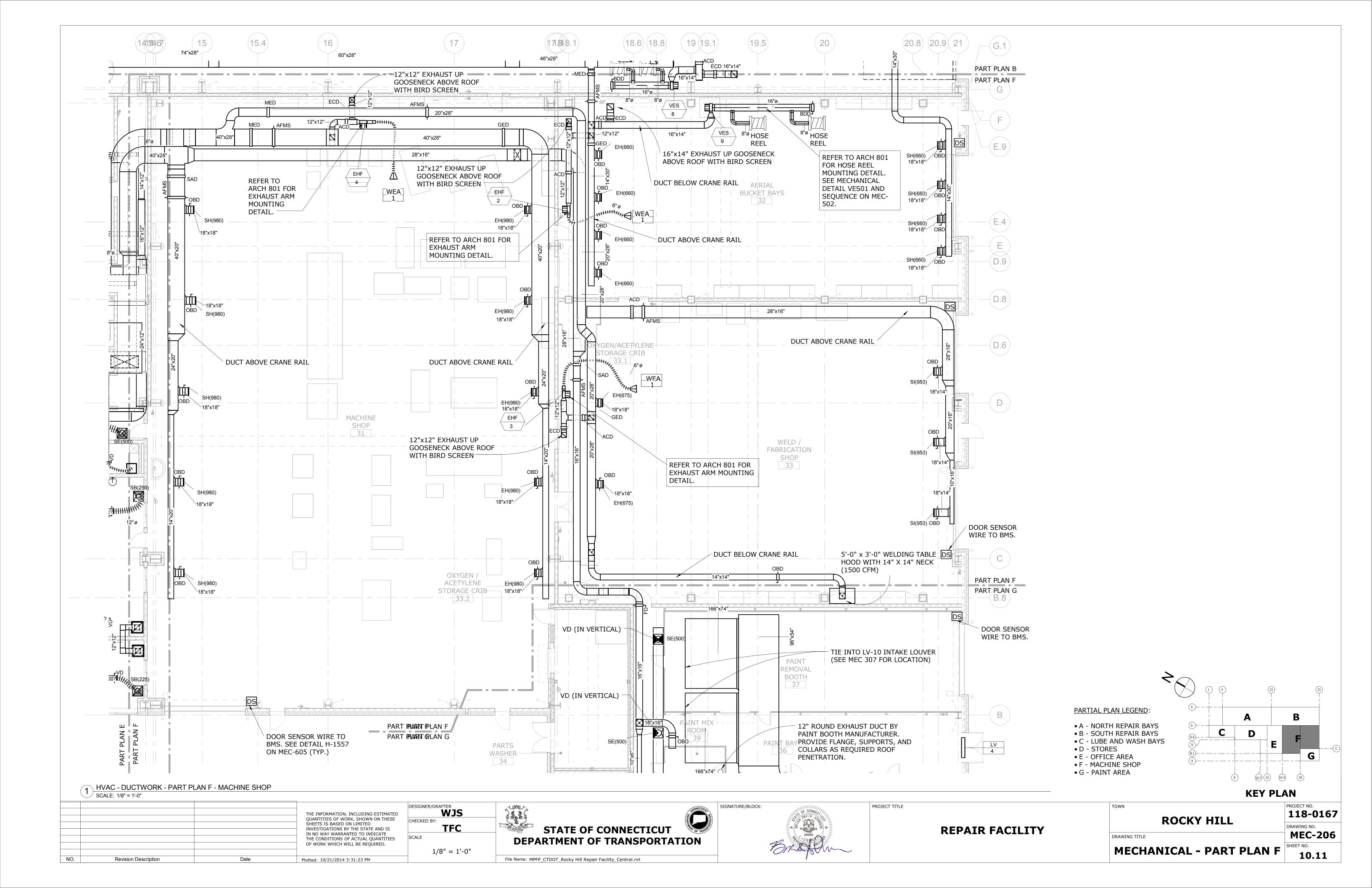


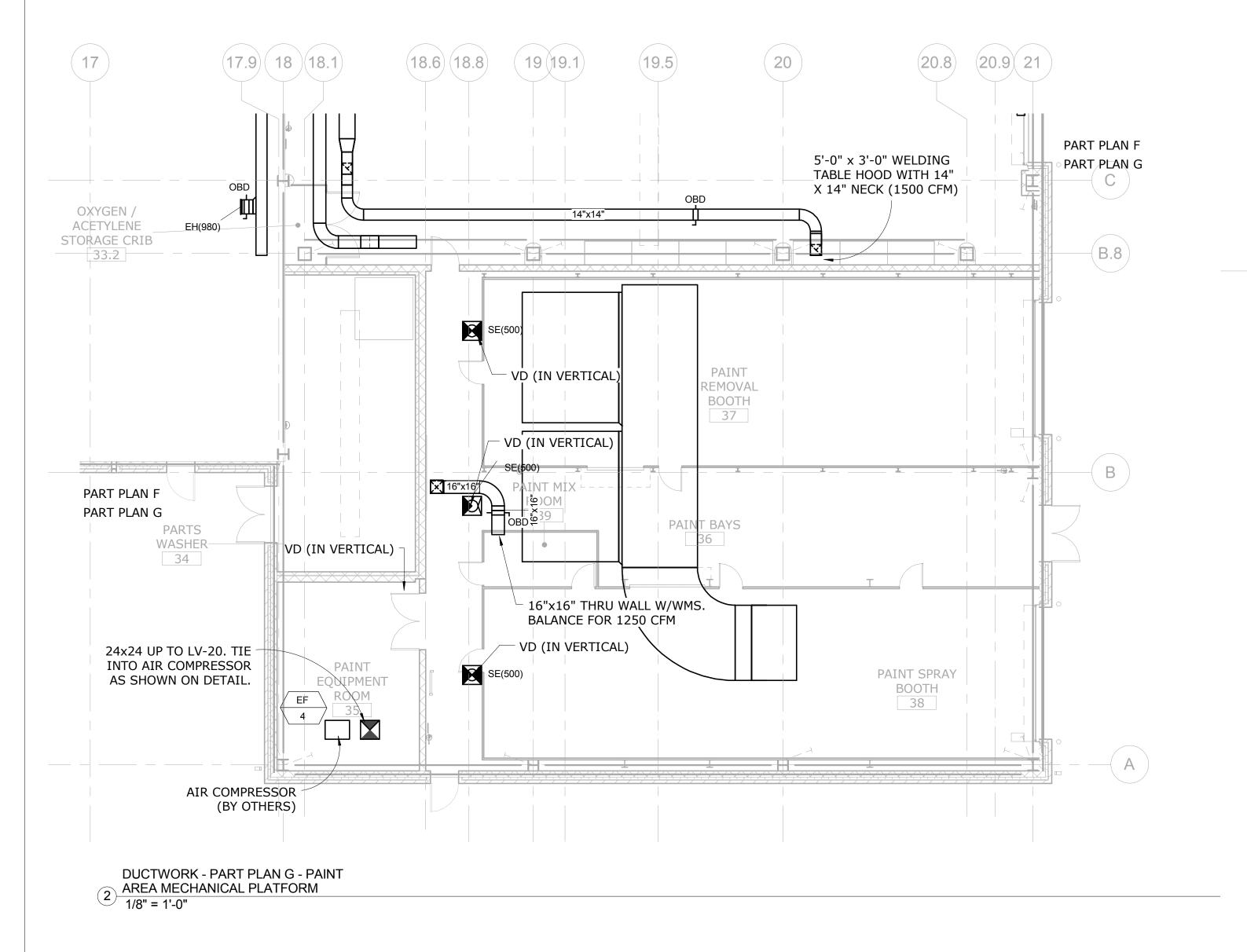
1 HVAC - DUCTWORK - PART PLAN D - STORES
SCALE: 1/8" = 1'-0"

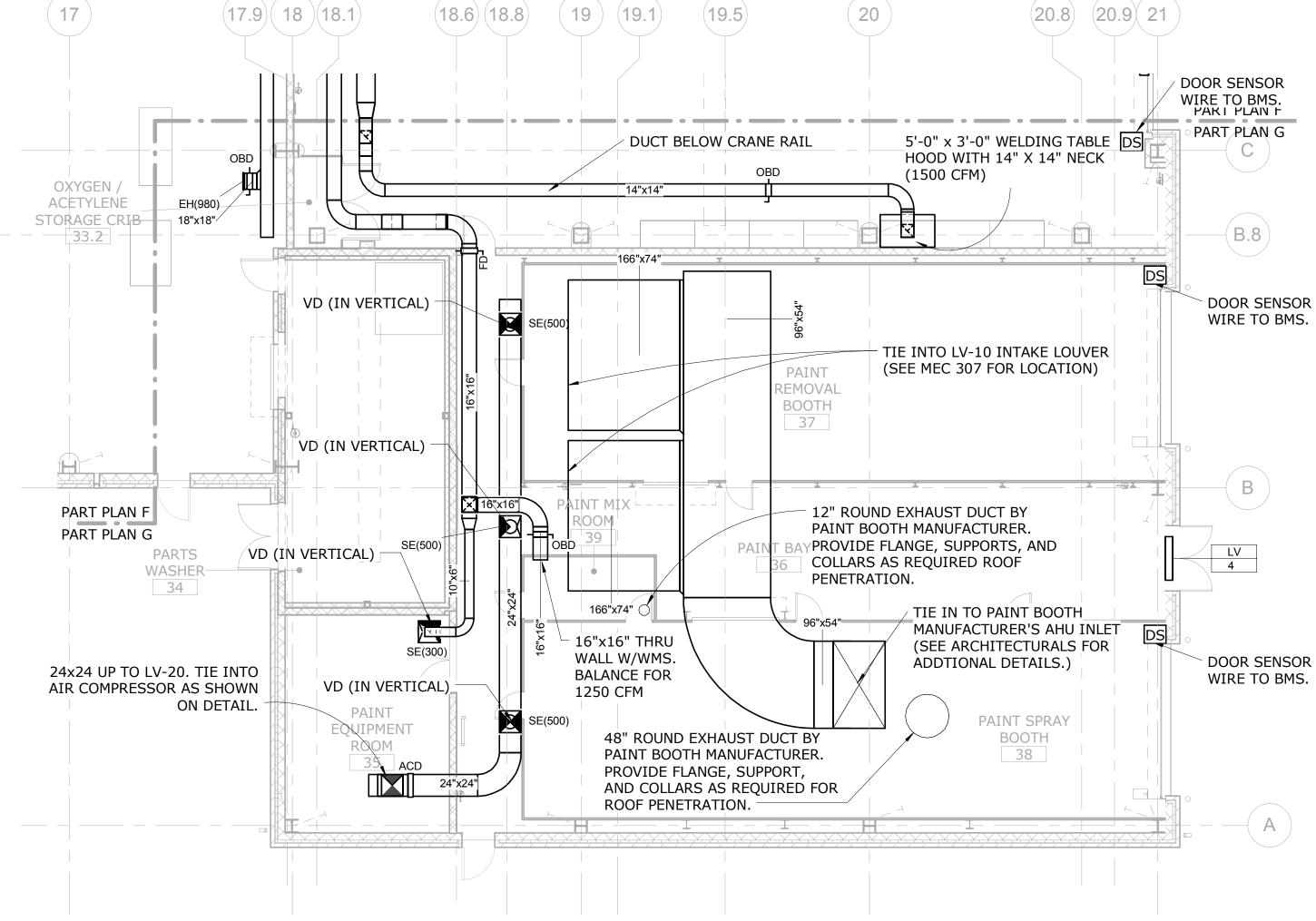


THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE **ROCKY HILL** SHEETS IS BASED ON LIMITED TFC DRAWING NO. **STATE OF CONNECTICUT REPAIR FACILITY** INVESTIGATIONS BY THE STATE AND IS **MEC-204** IN NO WAY WARRANTED TO INDICATE
THE CONDITIONS OF ACTUAL QUANTITIES **DEPARTMENT OF TRANSPORTATION** OF WORK WHICH WILL BE REQUIRED. **MECHANICAL - PART PLAN D** 1/8" = 1'-0"10.09 Revision Description Date File Name: MPFP_CTDOT_Rocky Hill Repair Facility_Central.rvt Plotted: 10/21/2014 3:30:57 PM

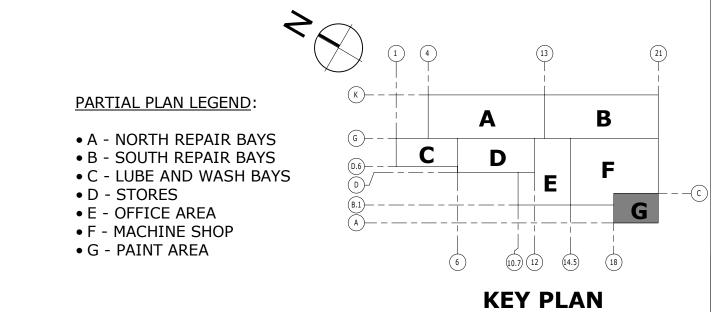




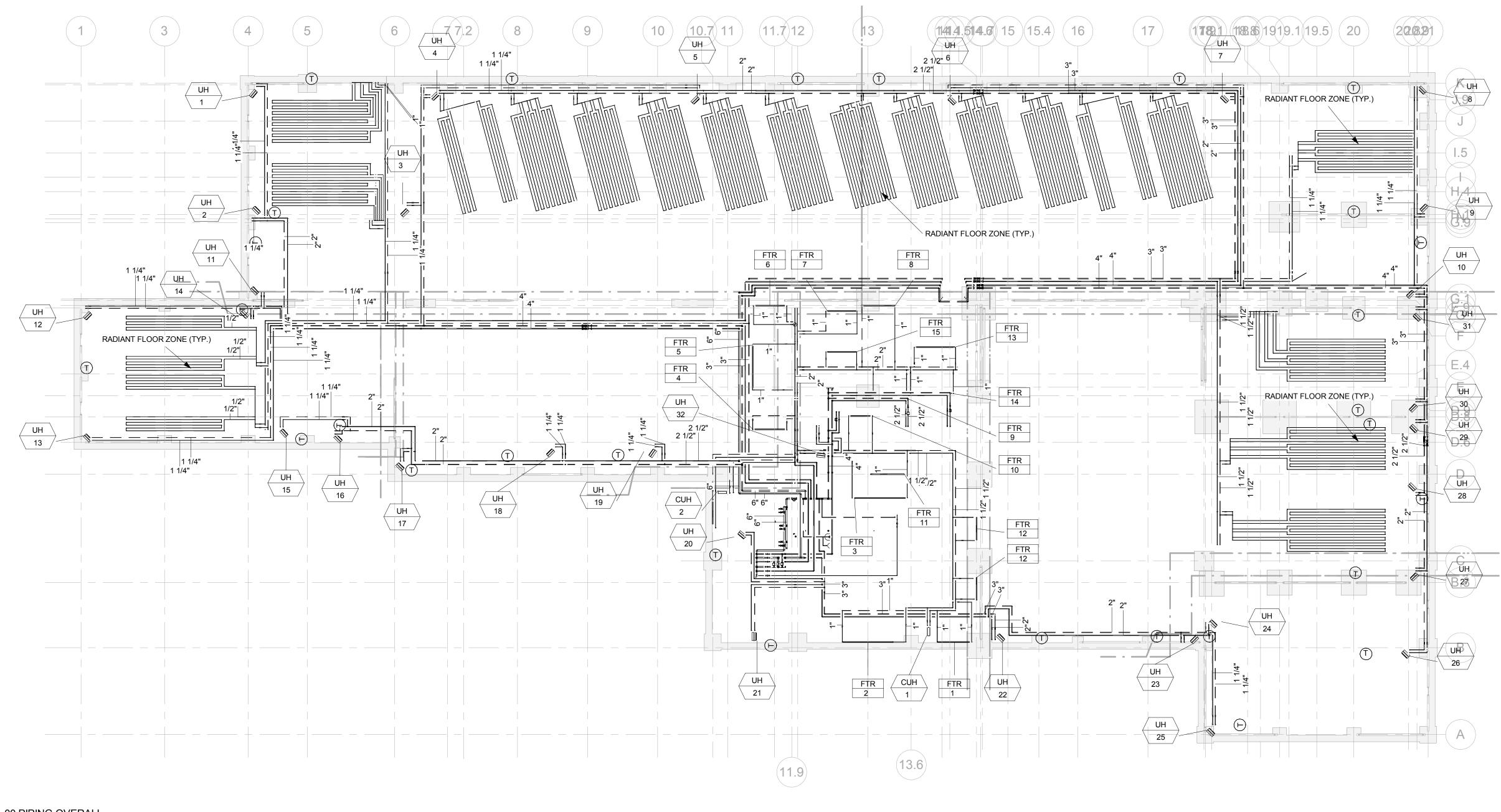




1 HVAC - DUCTWORK - PART PLAN G - PAINT AREA SCALE: 1/8" = 1'-0"



DESIGNER/DRAFTER PROJECT TITLE WJS 118-0167 THE INFORMATION, INCLUDING ESTIMATED **ROCKY HILL** QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED DRAWING NO. TFC **REPAIR FACILITY STATE OF CONNECTICUT** INVESTIGATIONS BY THE STATE AND IS **MEC-207** IN NO WAY WARRANTED TO INDICATE DRAWING TITLE **DEPARTMENT OF TRANSPORTATION** THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED. **MECHANICAL - PART PLAN G** 1/8" = 1'-0"10.12 Revision Description Date Plotted: 10/21/2014 3:31:34 PM File Name: MPFP_CTDOT_Rocky Hill Repair Facility_Central.rvt



1 HVAC - 00 PIPING OVERALL SCALE: 3/64" = 1'-0"

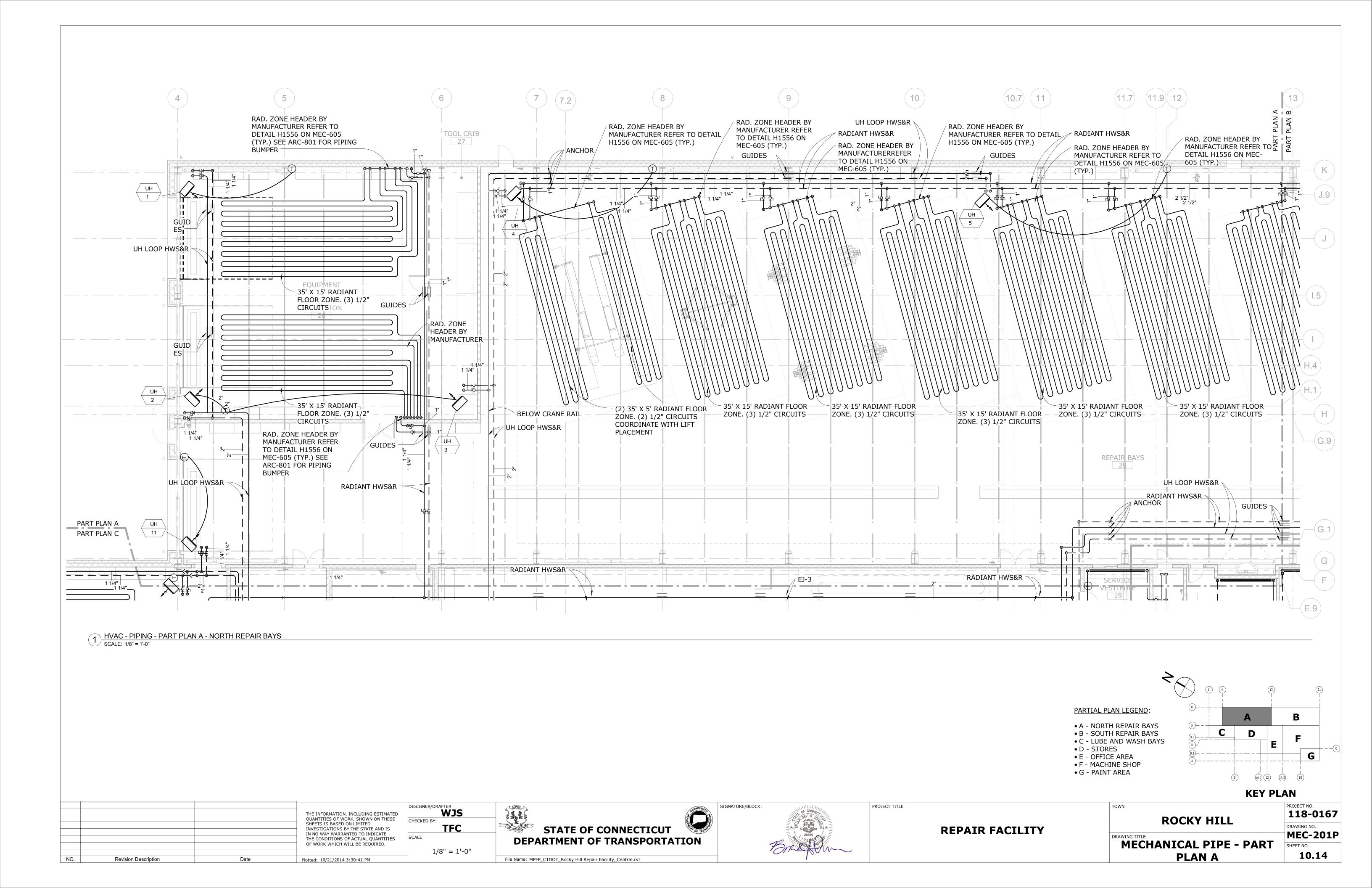
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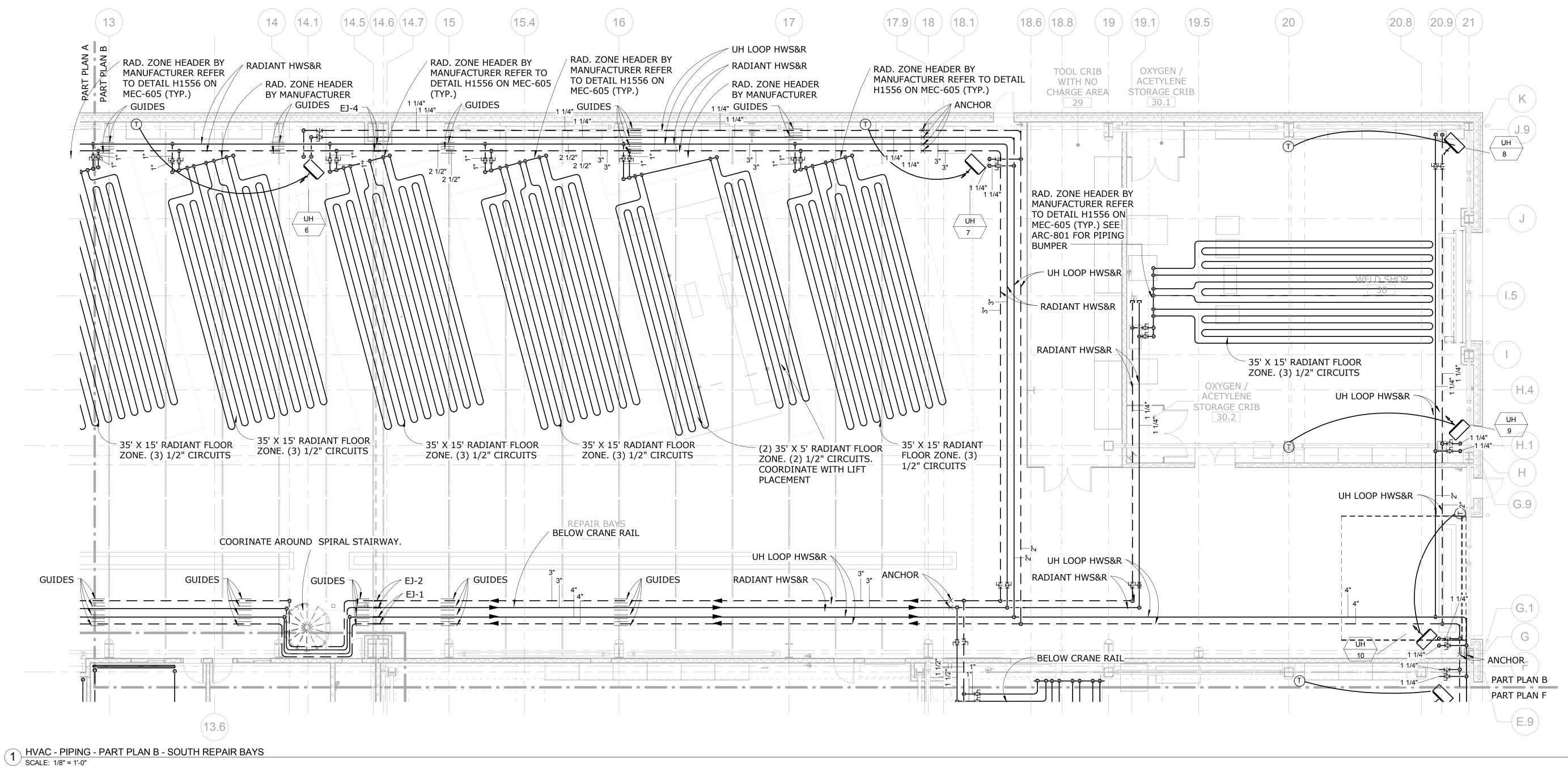
1) COORDINATE RADIANT SLAB PIPING WITH LIFT LOCATIONS. REFER TO ARC-100

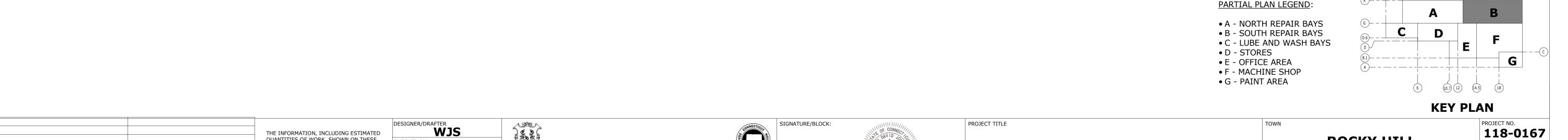
2) COORDINATE RADIANT SLAB PIPING WITH FLOOR ANCHOR LOCATIONS. REFER TO ARC-102

PARTIAL PLAN LEGEND: • A - NORTH REPAIR BAYS • B - SOUTH REPAIR BAYS • C - LUBE AND WASH BAYS • D - STORES • E - OFFICE AREA • F - MACHINE SHOP • G - PAINT AREA • KEY PLAN

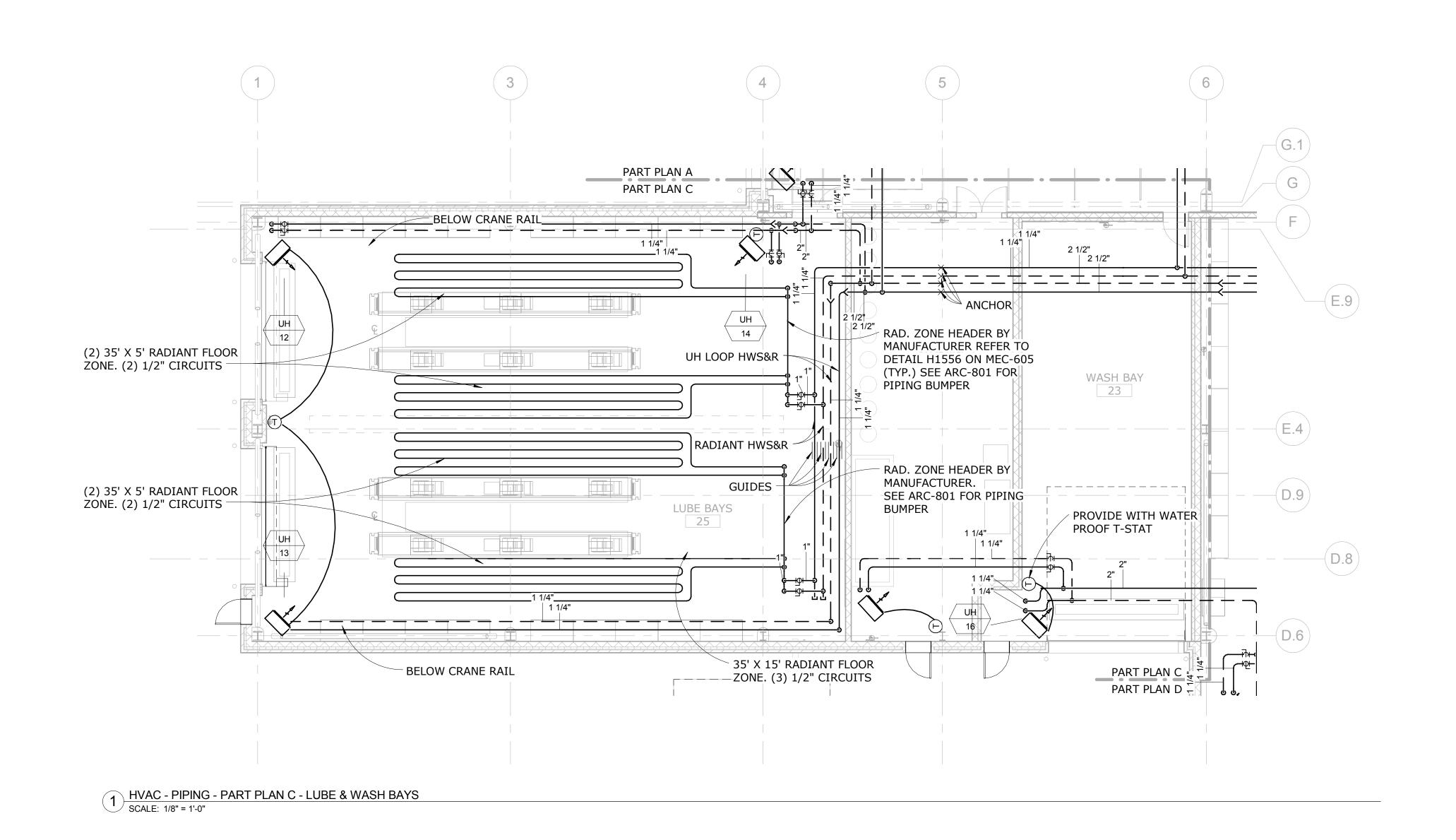
	THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED. DESIGNER/DRAFTER WJS CHECKED BY: SCALE SCALE 3/64" = 1'-0"	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	SIGNATURE/BLOCK: PROJECT TITLE PROJECT TITLE	REPAIR FACILITY	ROCKY HILL DRAWING TITLE OVERALL PIPE PLAN	PROJECT NO. 118-0167 DRAWING NO. MEC-200P SHEET NO. 10.13
NO. Revision Description Date	Plotted: 10/21/2014 3:30:25 PM	File Name: MPFP_CTDOT_Rocky Hill Repair Facility_Central.rvt				10.13

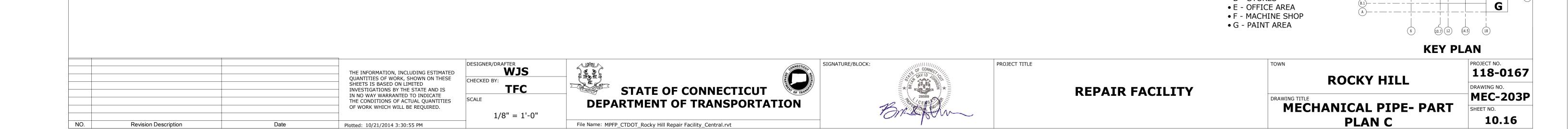






ROCKY HILL QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED DRAWING NO. TFC **REPAIR FACILITY STATE OF CONNECTICUT** INVESTIGATIONS BY THE STATE AND IS **MEC-202P** IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES **DEPARTMENT OF TRANSPORTATION MECHANICAL PIPE - PART** OF WORK WHICH WILL BE REQUIRED. 1/8" = 1'-0"10.15 **PLAN B** Revision Description Plotted: 10/21/2014 3:30:51 PM File Name: MPFP_CTDOT_Rocky Hill Repair Facility_Central.rvt





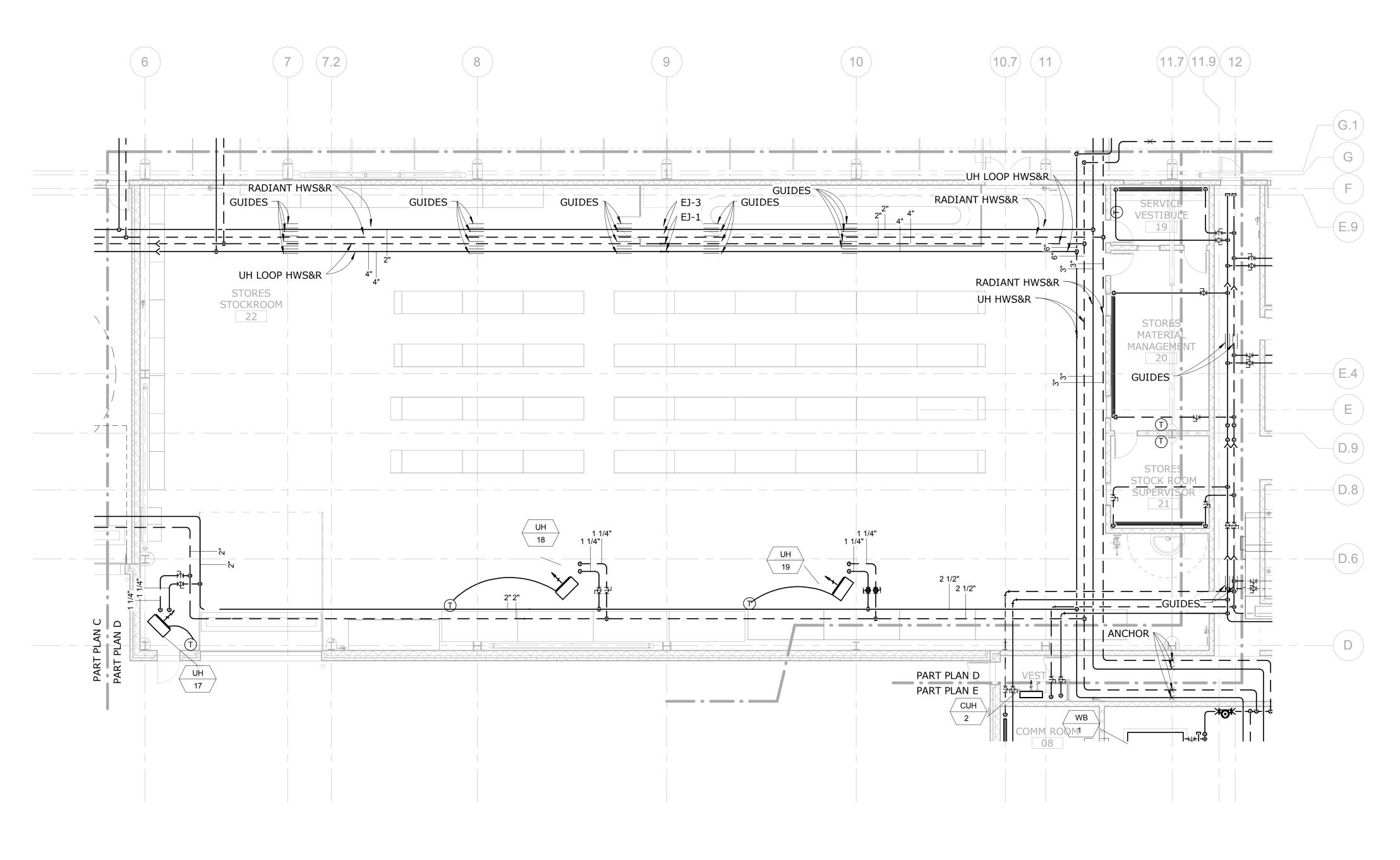
PARTIAL PLAN LEGEND:

• D - STORES

A - NORTH REPAIR BAYSB - SOUTH REPAIR BAYS

• C - LUBE AND WASH BAYS

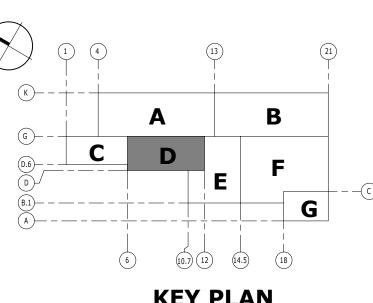
G



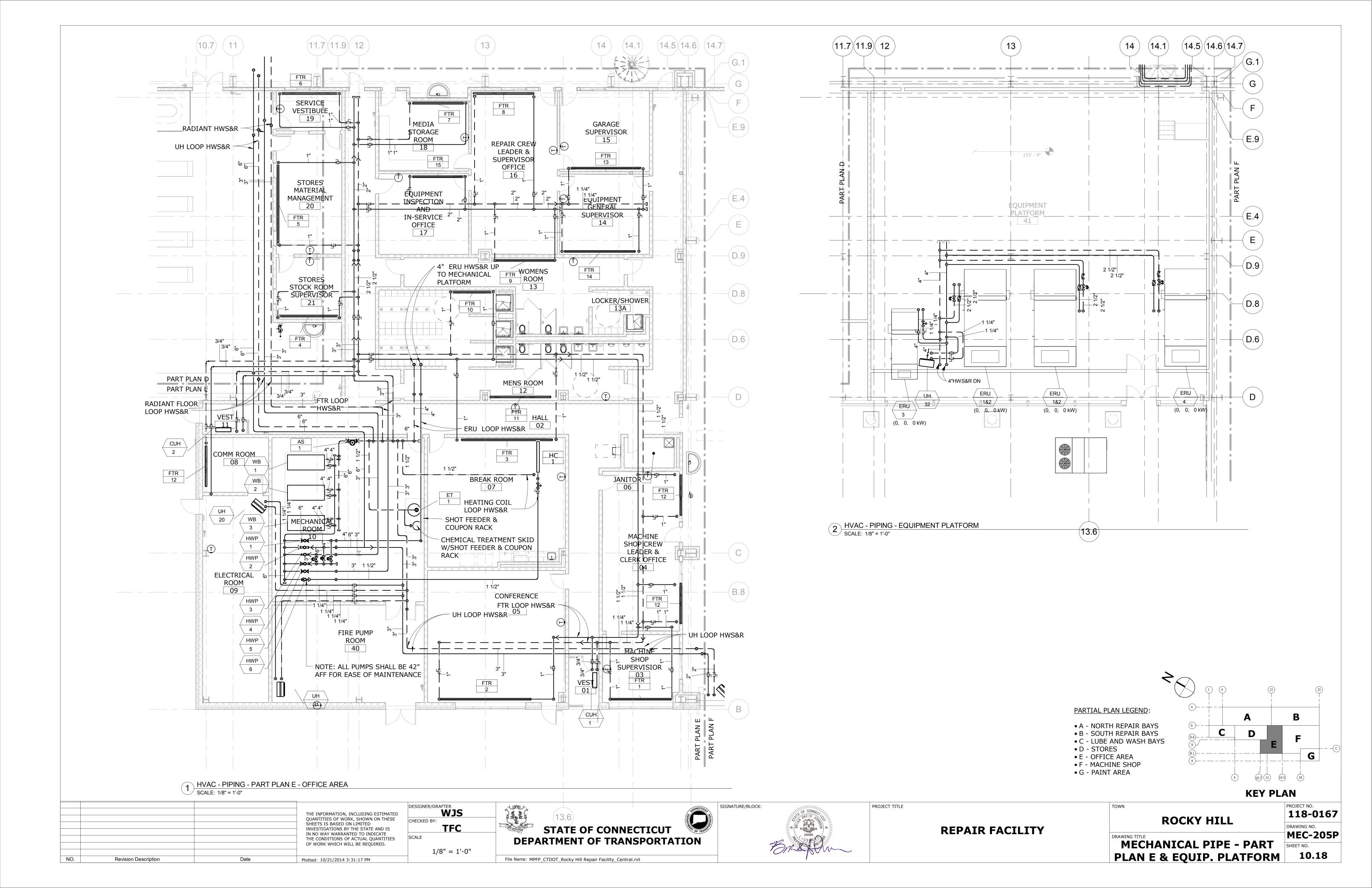
1 HVAC - PIPING - PART PLAN D - STORES
SCALE: 1/8" = 1'-0"

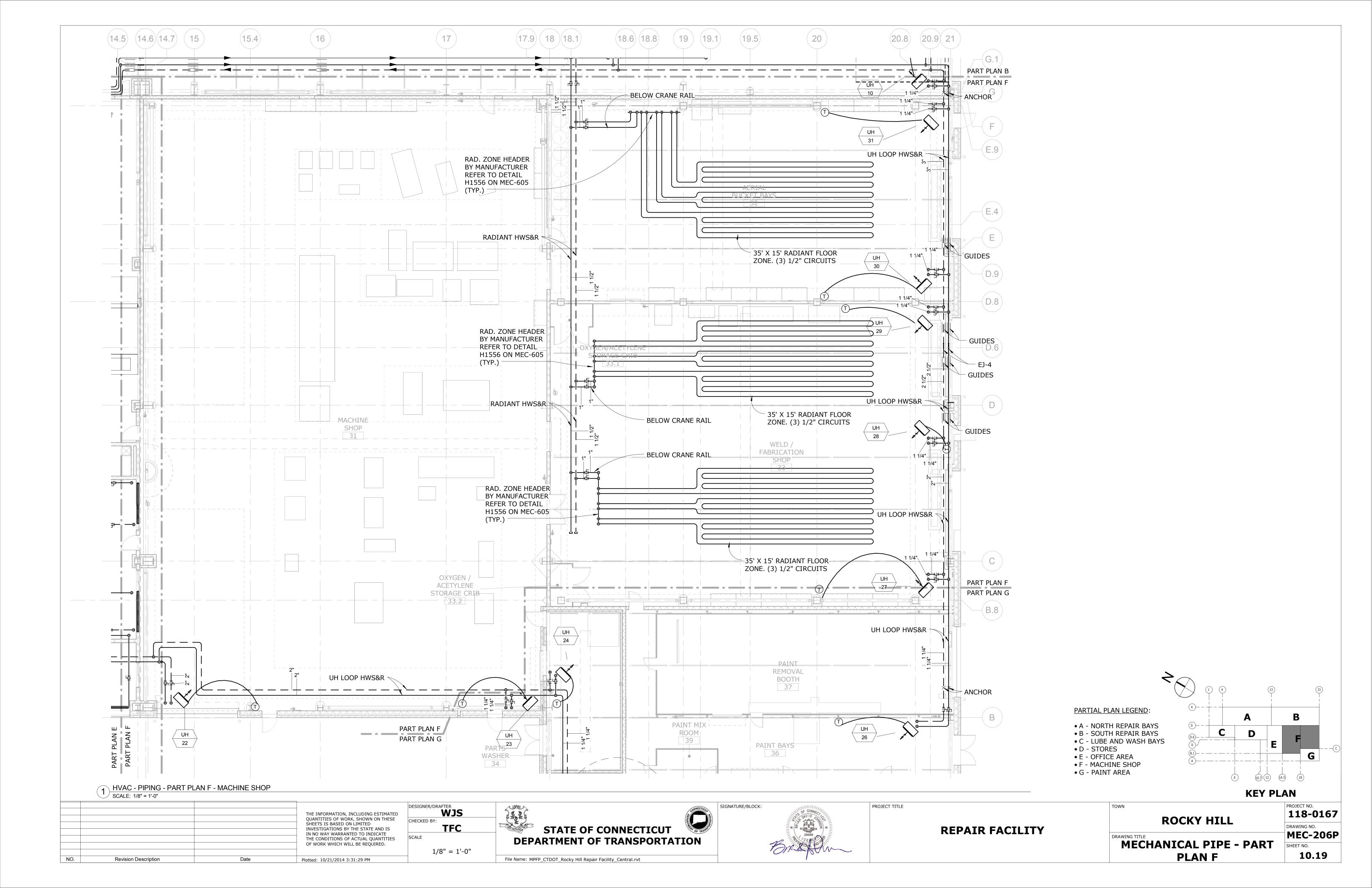


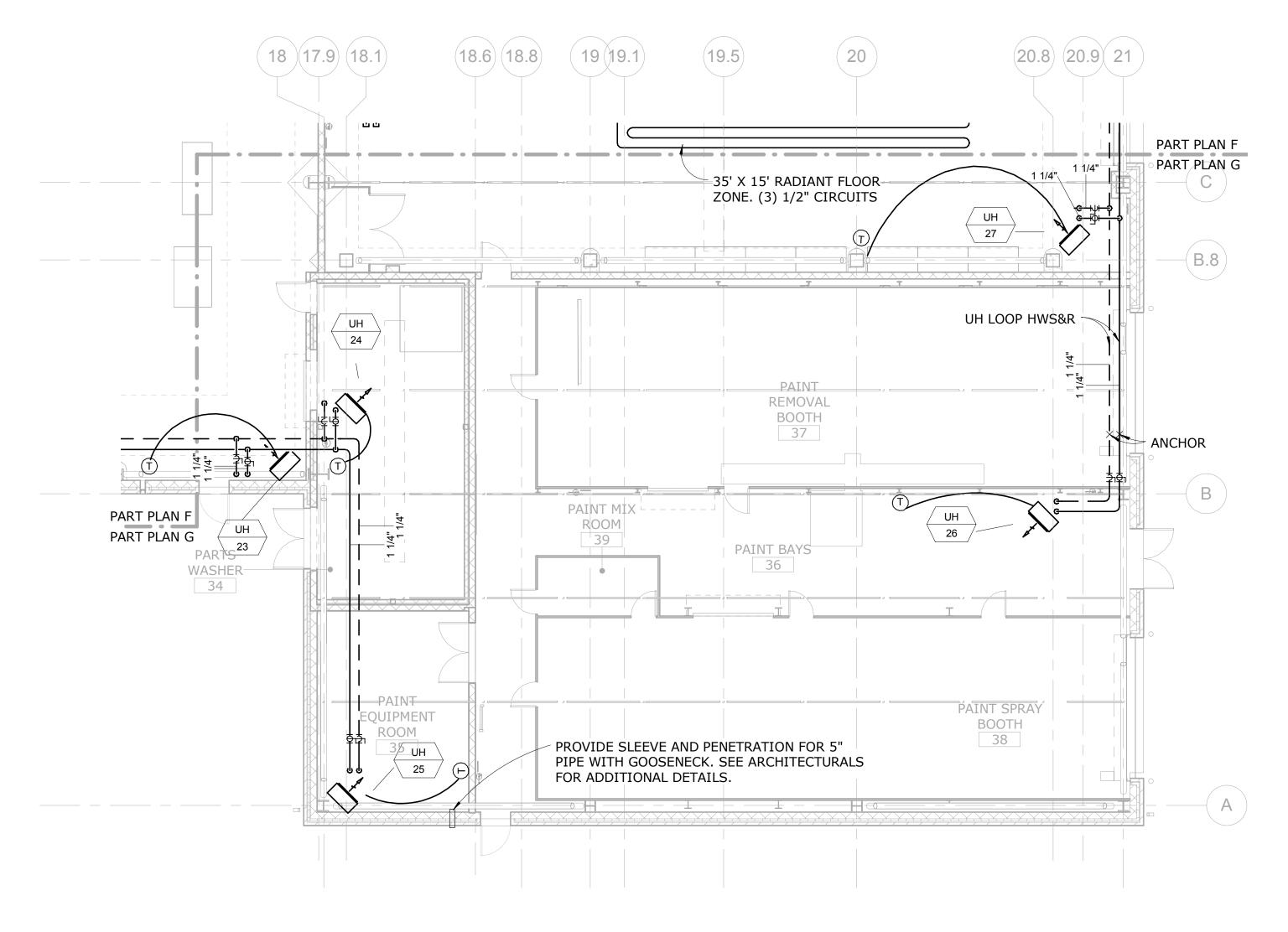
- A NORTH REPAIR BAYS
 B SOUTH REPAIR BAYS
 C LUBE AND WASH BAYS
 D STORES
 E OFFICE AREA
 F MACHINE SHOP
 G PAINT AREA



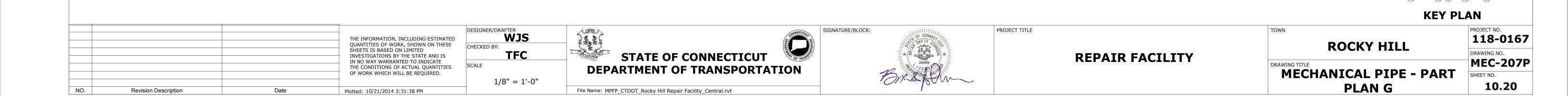
	THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED DESIGNER/DRAFTER WJS CHECKED BY:	COUNTECTICITY TO SERVICE THE COUNTECT OF THE C	SIGNATURE/BLOCK: PROJECT TITLE PROJECT TITLE		ROCKY HILL	PROJECT NO. 118-0167 DRAWING NO.
	INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED. 1/8" = 1'-0"	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	28569 C E MS	REPAIR FACILITY	MECHANICAL PIPE - PART	
NO. Revision Description Date	Plotted: 10/21/2014 3:31:00 PM	File Name: MPFP CTDOT Rocky Hill Repair Facility Central.rvt	/50		PLAN D	10.17







1 HVAC - PIPING - PART PLAN G - PAINT AREA SCALE: 1/8" = 1'-0"

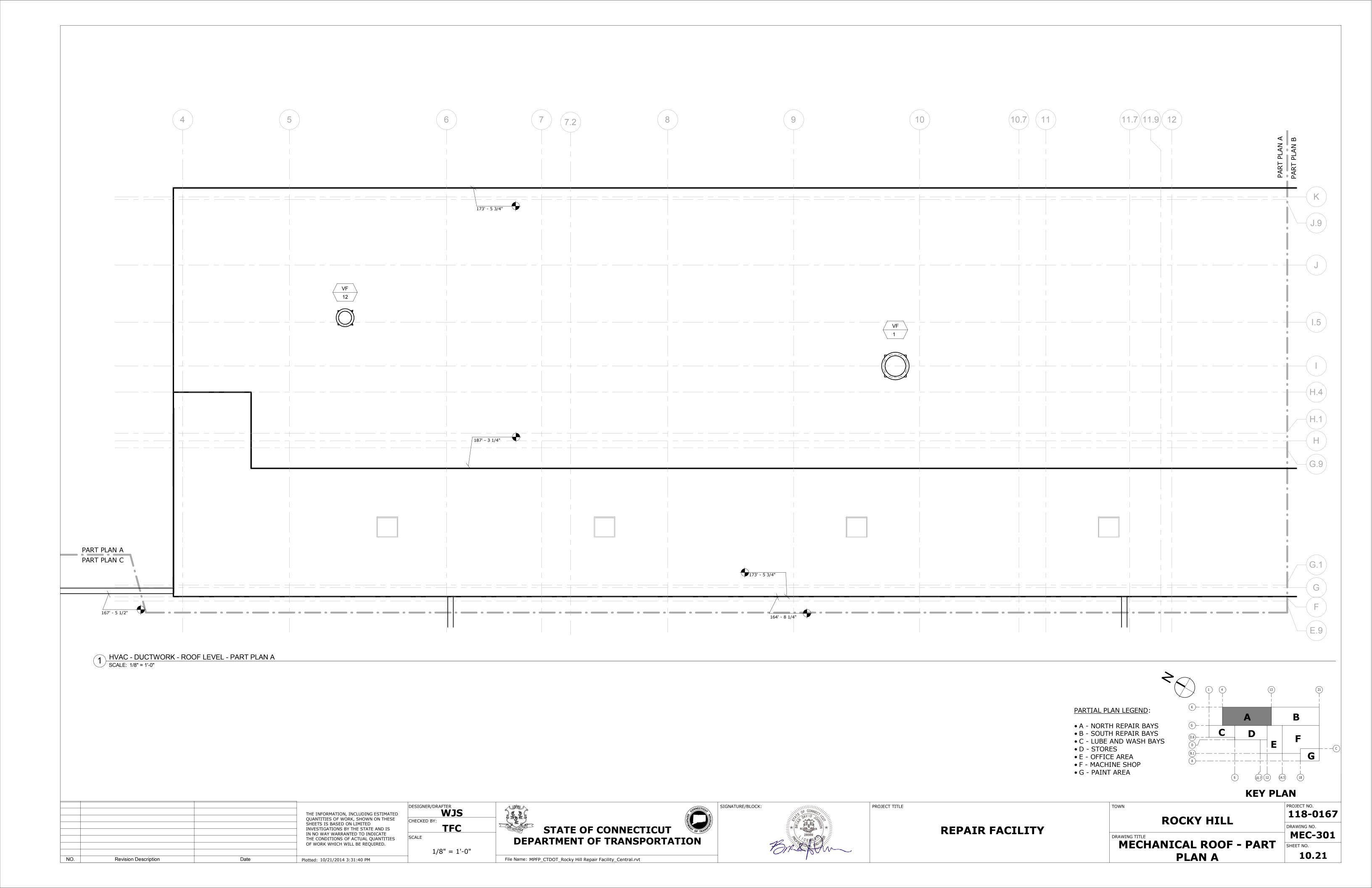


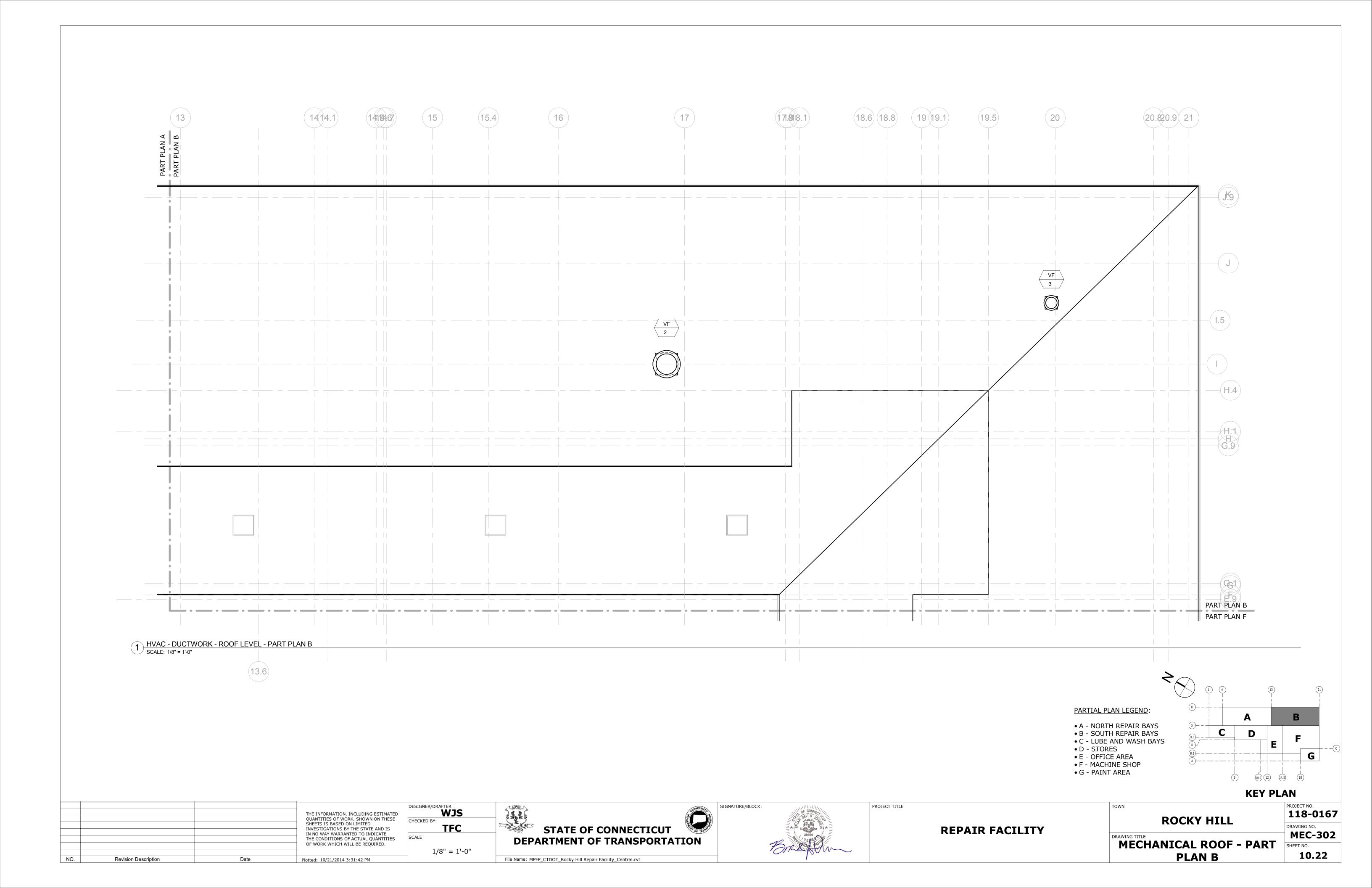
PARTIAL PLAN LEGEND:

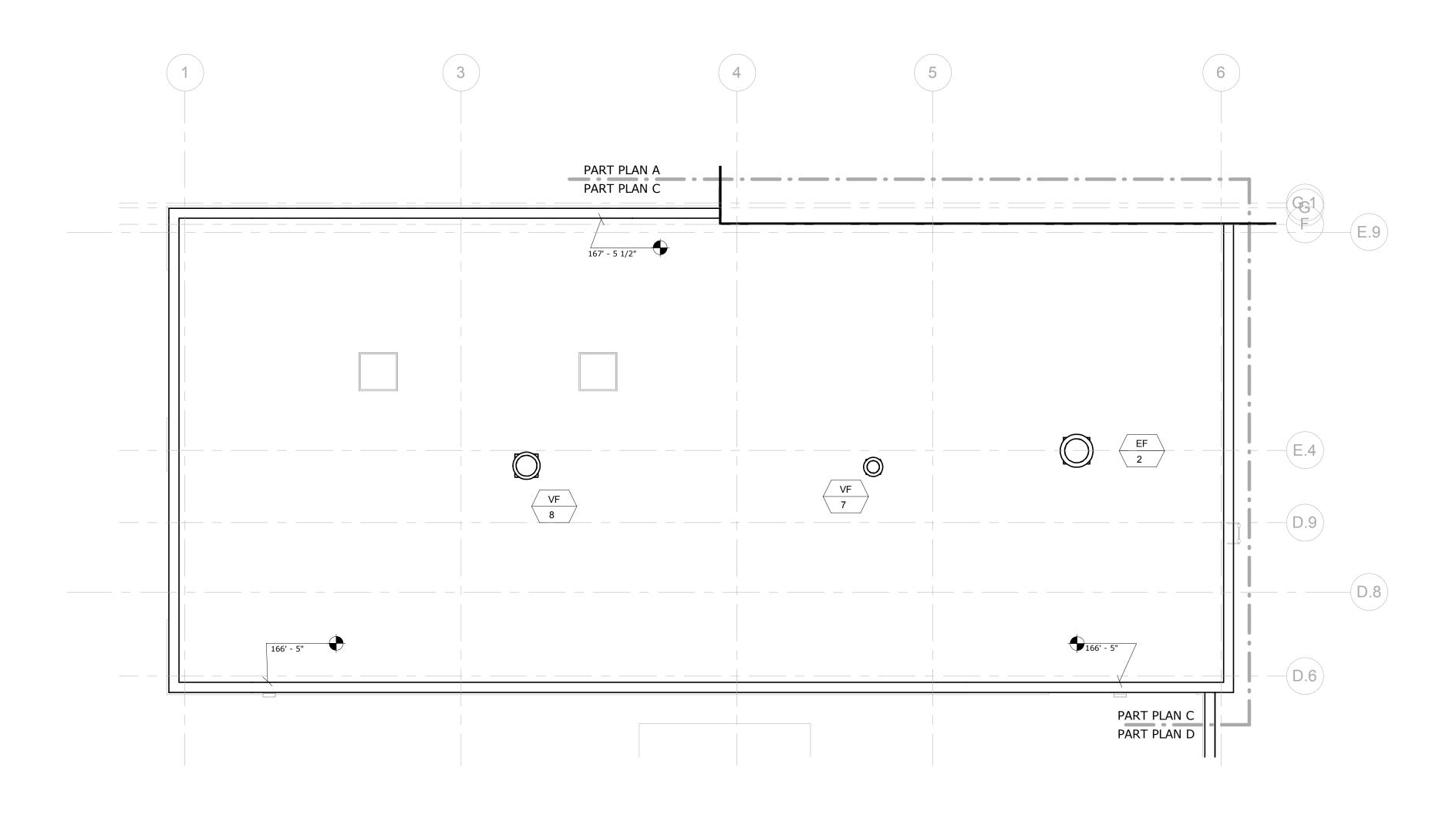
D - STORESE - OFFICE AREA

• F - MACHINE SHOP • G - PAINT AREA

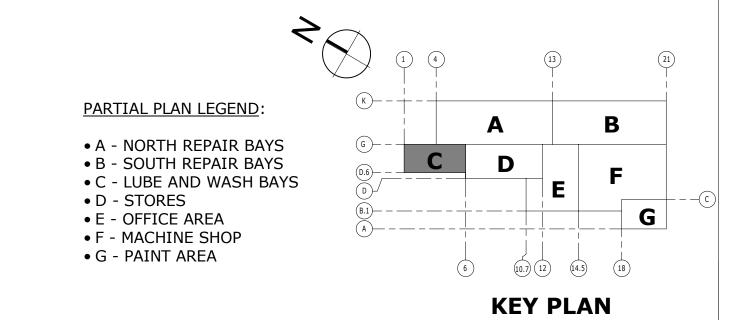
A - NORTH REPAIR BAYSB - SOUTH REPAIR BAYSC - LUBE AND WASH BAYS



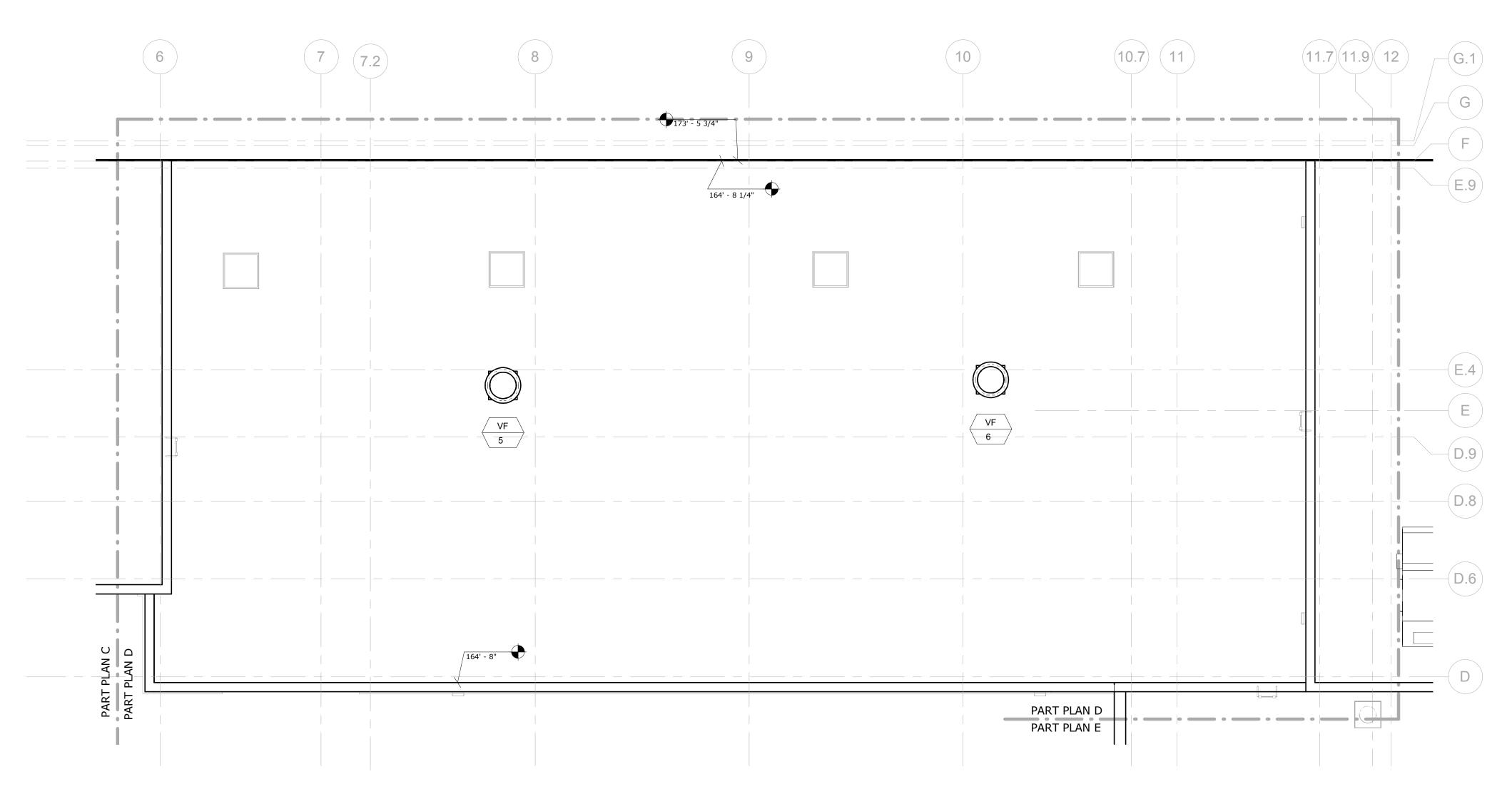




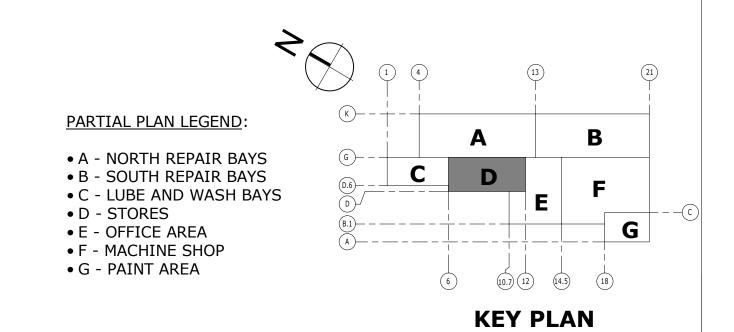
1 HVAC - DUCTWORK - ROOF LEVEL - PART PLAN C
SCALE: 1/8" = 1'-0"



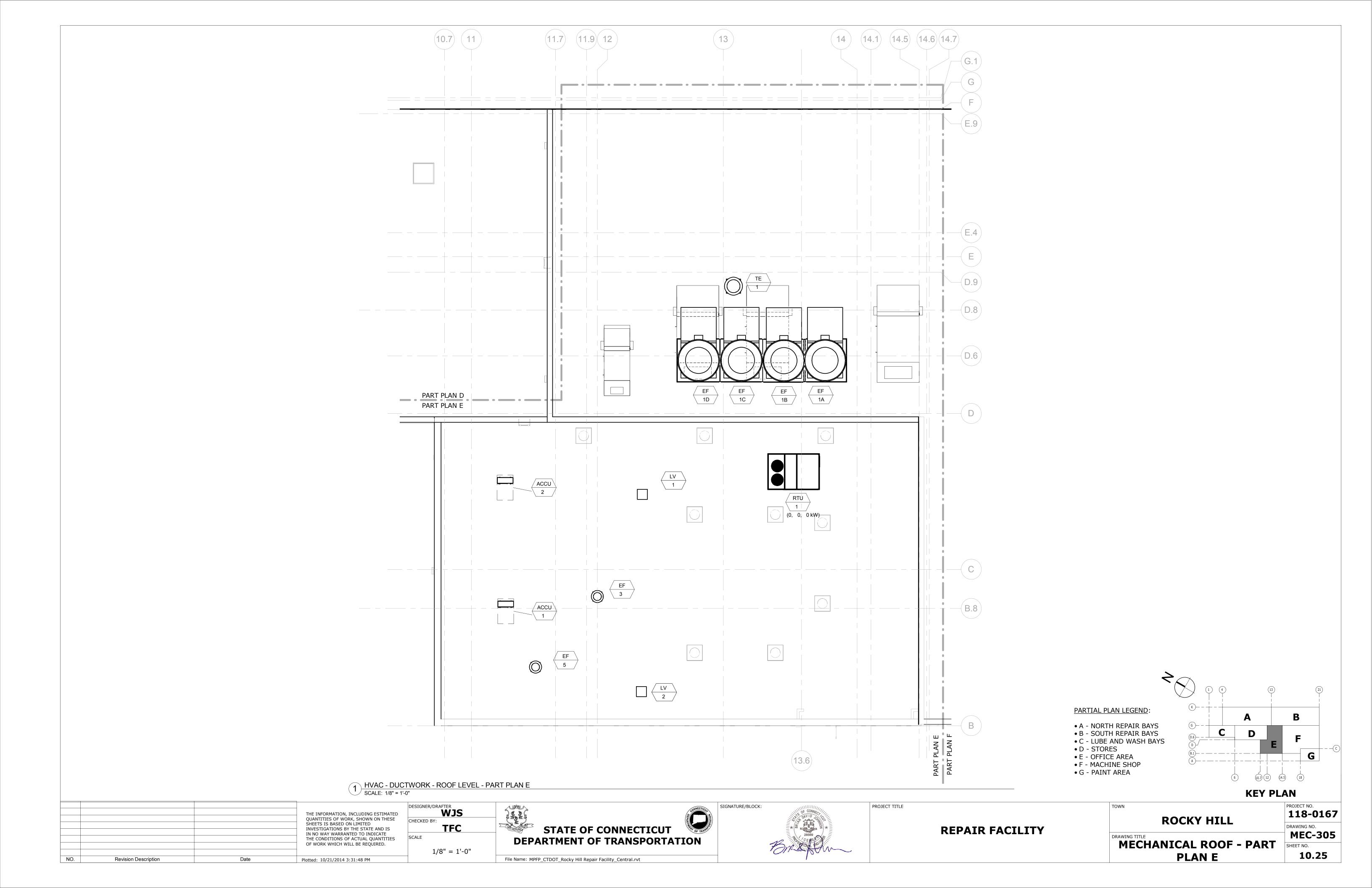
DESIGNER/DRAFTER WJS PROJECT NO. **118-0167** THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED. **ROCKY HILL** TFC DRAWING NO. STATE OF CONNECTICUT **REPAIR FACILITY MEC-303** MECHANICAL ROOF - PART **DEPARTMENT OF TRANSPORTATION** 1/8" = 1'-0" 10.23 **PLAN C** Revision Description Plotted: 10/21/2014 3:31:43 PM File Name: MPFP_CTDOT_Rocky Hill Repair Facility_Central.rvt

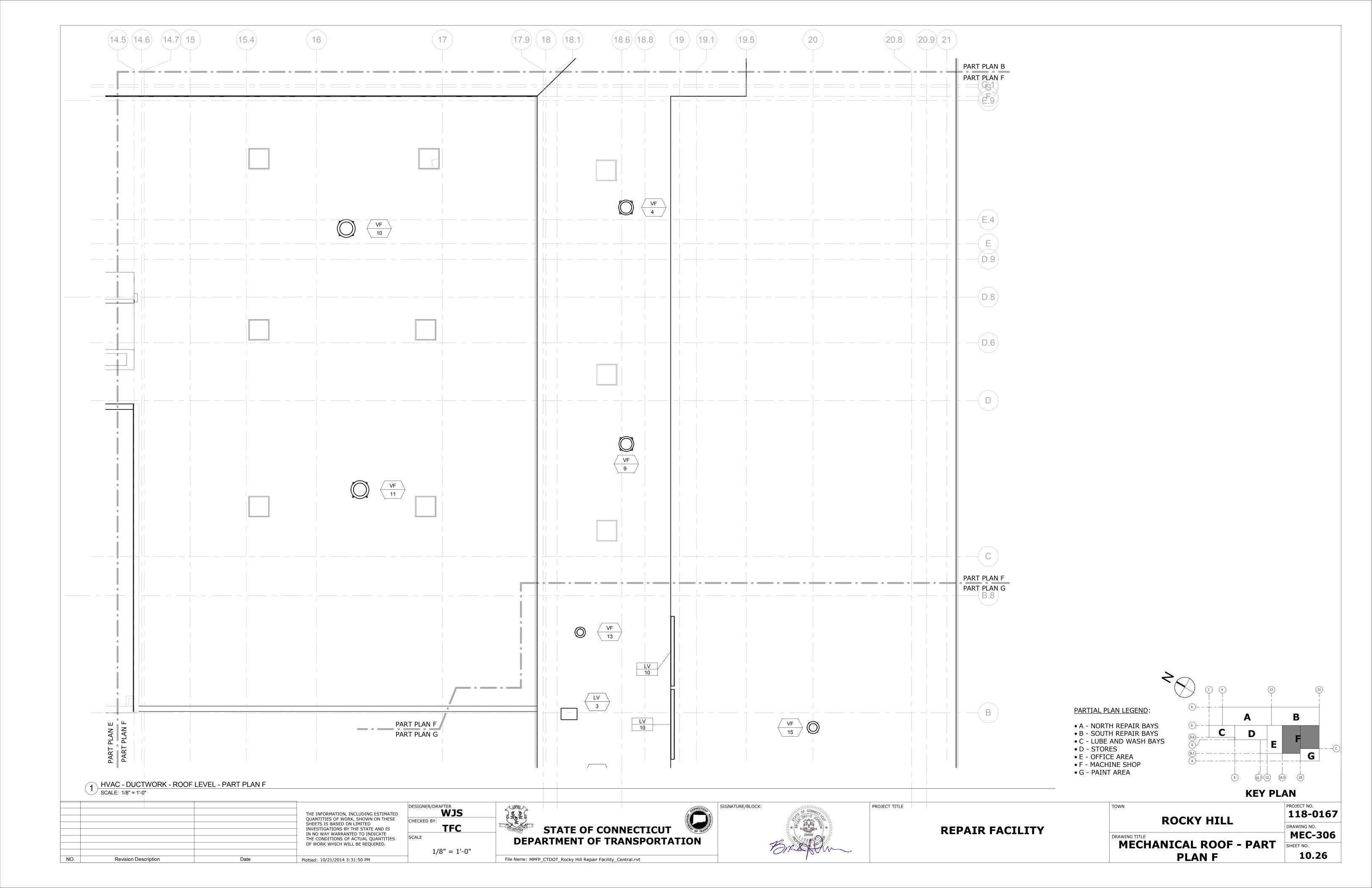


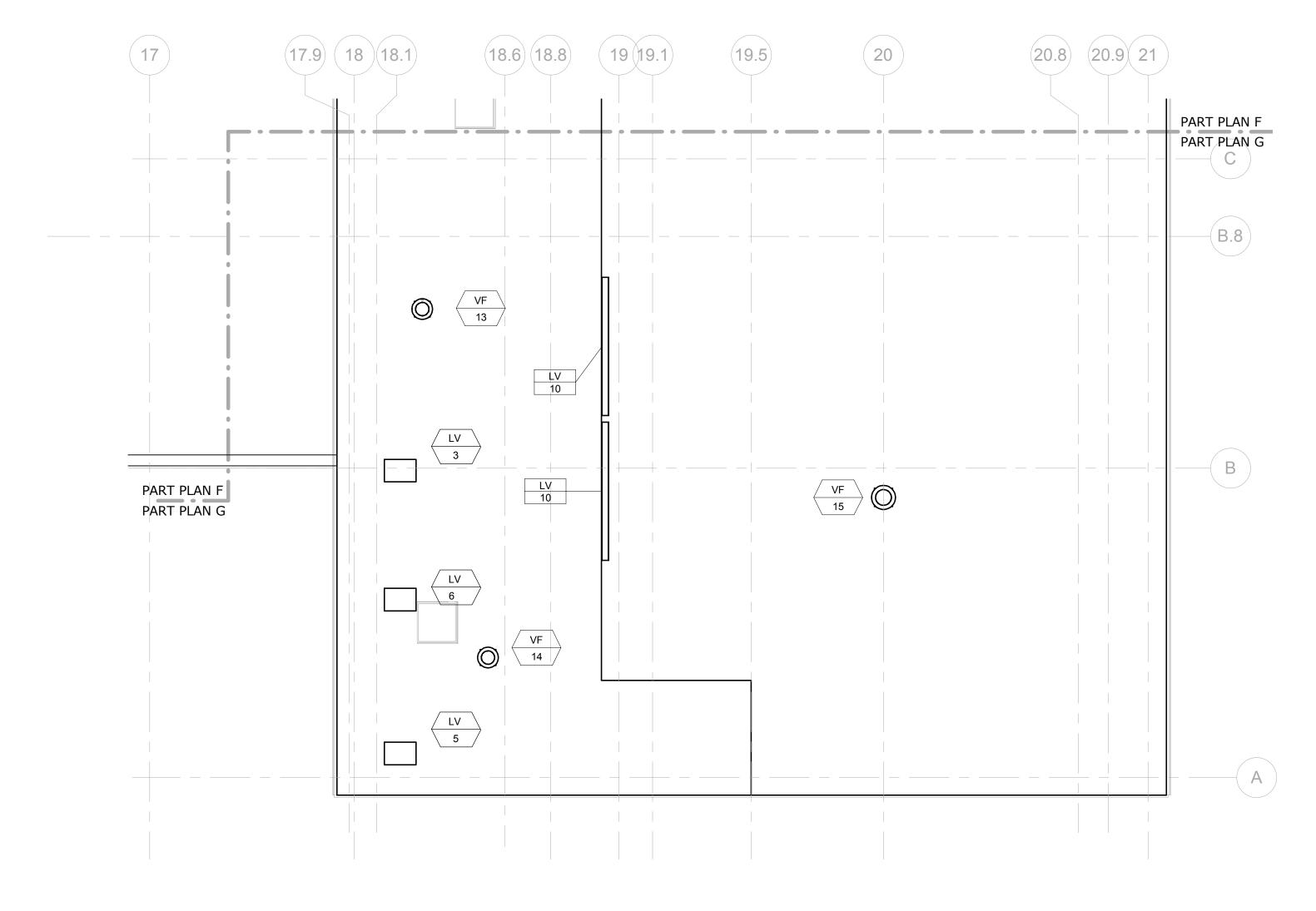
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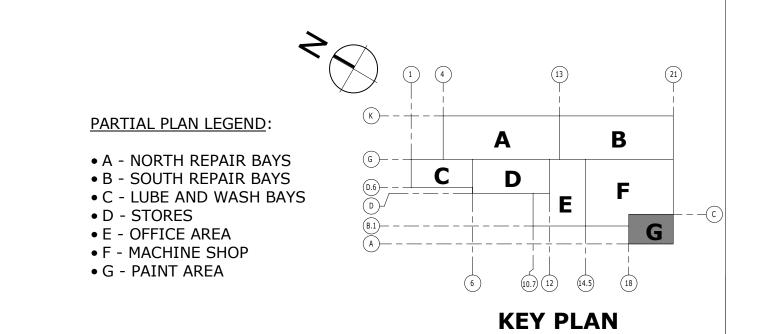
			THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.	DESIGNER/DRAFTER WJS CHECKED BY: TFC SCALE 1/8" = 1'-0"	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	SIGNATURE/BLOCK: OF CO ON THE COLUMN AND THE COLU	PROJECT TITLE	REPAIR FACILITY	ROCKY HILL DRAWING TITLE MECHANICAL ROOF - PART	
NO.	Revision Description	Date	Plotted: 10/21/2014 3:31:45 PM		File Name: MPFP_CTDOT_Rocky Hill Repair Facility_Central.rvt				PLAN D	10.24







1 HVAC - DUCTWORK - ROOF LEVEL - PART PLAN G
SCALE: 1/8" = 1'-0"



	THE INFORMATION, INCLUDING ESTIMATED
	QUANTITIES OF WORK, SHOWN ON THESE
	SHEETS IS BASED ON LIMITED
	INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE
	THE CONDITIONS OF ACTUAL QUANTITIES
	OF WORK WHICH WILL BE REQUIRED.

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Revision Description

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File Name: MPFP_CTDOT_Rocky Hill Repair Facility_Central.rvt



REPAIR FACILITY

ROCKY HILL

DRAWING TITLE

MECHANICAL ROOF - PART

PLAN G

PROJECT NO. **118-0167**

MEC-307

10.27

DRAWING NO.

- BOILER MANUFACTURER SHALL PROVIDE BOILER CONTROLLER TO SEQUENCE AND MODULATE ALL BOILERS, AND PROVIDE MODBUS, BACNET, OR LONTALK 2-WAY COMMUNICATIONS, INCLUDING ALARMS, BETWEEN THE BOILER CONTROLLER AND THE BAS. BOILER CONTROLS SHALL BE SET-UP BY THE MANUFACTURER TO INTERLOCK WITH ANY ASSOCIATED COMBUSTION AIR DAMPERS, ISOLATION VALVES, AND VENT DAMPERS. BAS CONTRACTOR SHALL INSTALL AND WIRE REMOTE SENSORS FURNISHED BY THE BOILER MANUFACTURER, PROVIDE LINE SIZED 2-POSITION BOILER ISOLATION VALVES (WITH POSITION INDICATION AND CONTROL SIGNALS INTERFACED WITH BOILER CONTROLS), PROVIDE ALL PUMP CONTROLS, AND PROVIDE DYNAMIC GRAPHICS (ALL DATA) OF THE BOILER SYSTEM AT THE OPERATOR'S WORKSTATION.
- 2. BAS CONTRACTOR SHALL MEET WITH BOILER CONTROLS MANUFACTURER TO COORDINATE THE REQUIRED CONTROL SIGNALS, STATUS SIGNALS (FOR THE BOILER SYSTEM. BAS CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTATION OF ALL NECESSARY CONTROL SEQUENCES INCLUDING ALL CONTROL DEVICES AND LOGISTICS REQUIRED TO MEET THE DESIGN INTENT REGARDLESS OF WHAT MAY OR MAY NOT BE PROVIDED BY EQUIPMENT MANUFACTURERS.
- ALL SET POINTS AND TIME DELAYS SHALL BE ADJUSTABLE WITHOUT ANY PROGRAM CHANGES. ALL ACTUATORS SHALL BE ELECTRONIC. PROVIDE FOR LOCAL EQUIPMENT OVERRIDE OF CONTROL SYSTEM. BOILERS HAVE DUCTED COMBUSTION AIR. INDIVIDUAL COMBUSTION AIR DAMPERS (CAD) PROVIDED BY BOILER MANUFACTURER SHALL PROVE AT LEAST 85% OPEN BEFORE BURNER CAN START AND PROVE CLOSED AFTER BURNER STOPS. IF ANY CAD OR FID FAILS, AN ALARM SHALL BE SENT TO THE BAS AND, IF NEEDED, THE NEXT BOILER IN
- 5. PROVIDE TEMPERATURE SENSORS AND OTHER DEVICES SHOWN AND COORDINATE ALL SENSOR INSTALLATION LOCATIONS WITH THE MECHANICAL CONTRACTOR. COORDINATE AND INSURE MANUFACTURER'S RECOMMENDED UPSTREAM AND DOWNSTREAM PIPE DIAMETERS ARE PROVIDED ESPECIALLY FOR FLOW METERS. WIRE BOILER MANUFACTURER'S CONTROLLER TO EACH BOILER AND SENSOR PER MANUFACTURER'S DIAGRAMS. COORDINATE TO OBTAIN ALL INFO FOR BAS GRAPHICS.
- 6. BAS CONTRACTOR SHALL PROVIDE AND WIRE INDIVIDUAL FIRESTATS (NOT SHOWN) TO SHUTDOWN EACH BOILER AND INSURE THE BOILER EMERGENCY SHUT-OFF SWITCHES STOP ALL BOILERS.

HOT WATER CONTROL

- THE BOILER SYSTEM SHALL NORMALLY BE ON AND SHALL BE CAPABLE OF BEING AUTOMATICALLY STARTED AND STOPPED BY THE BAS. THE CONTROL OF BOILER STAGING AND CAPACITY SHALL BE BY THE BOILER MANUFACTURER.
- BEFORE THE BOILERS ARE STARTED, THE LEAD BOILERS ISOLATION VALVE (BIV) SHALL BE OPENED AND THE HOT WATER PUMP ASSOCIATED WITH THE SYSTEM CALLING FOR HEAT SHALL BE STARTED AT LOW SPEED BY THE BAS. IF PUMP FAILS, THE BAS SHALL ALARM.
- OPERATING SPEED FOR THE PUMP SHALL BE THE LOWEST REQUIRED TO MAINTAIN THE SET POINT OF THE ASSOCIATED REMOTE DIFFERENTIAL PRESSURE SENSOR (DPT) LOCATED NEAR THE FURTHEST EQUIPMENT (TYP OF 3). INITIAL SET POINT OF REMOTE DPT SHALL BE 15 PSI WITH FINAL SET POINT COORDINATED WITH THE BALANCING CONTRACTOR TO THE LOWEST NEEDED TO GET FULL FLOW TO THE MOST REMOTE EQUIPMENT (WITH THE EQUIPMENT CONTROL VALVE NO MORE THAN 90% OPEN).
- 4. THE BOILER SUPPLY WATER TEMPERATURE AT SENSOR BST SHALL BE INITIALLY SET TO A MAXIMUM OF 140°F. BOILERS SHALL STAGE CAPACITY AT OPTIMAL EFFICIENCY TO MAINTAIN COMMON SUPPLY WATER TEMPERATURE CONTROL

BOILER CONTROL SYSTEM

- WHEN A BOILER IS NEEDED TO OPERATE, THE ASSOCIATED COMBUSTION AIR DAMPER (CAD), AND BOILER ISOLATION VALVE (BIV) SHALL CLOSE 20 SECONDS (ADJ.) AFTER THE BURNER IS STOPPED. AN EXCEPTION IS THE LEAD BOILER WHOSE BIV SHALL ALWAYS REMAIN OPEN TO ALLOW PUMP FLOW. AS PROVIDED BY CONTROLS CONTRACTOR ON A CALL FOR HEATING, THE LEAD BOILER SHALL START ON LOW FIRE. THE BOILER HOT SUPPLY WATER TEMPERATURE AT BST SHALL BE MAINTAINED BY STAGING OF BOILERS AND MODULATING THE BURNERS. MANUFACTURER'S BOILER CONTROLLER SHALL START AND OPERATE THE LAG BOILERS WHEN NEEDED TO MAINTAIN EITHER THE SYSTEM
- SUPPLY TEMPERATURE AT BST OR WHEN THE SYSTEM WOULD OPERATE MORE EFFICIENTLY WITH MORE BOILERS ON. THE BOILER CONTROLLER SHALL ROTATE THE LEAD AND LAG BOILERS TO ASSURE THAT ALL BOILERS RECEIVE EQUAL RUN TIME.
- WHEN LOAD DROPS (BASED ON BOILER CAPACITY AND EFFICIENCY) LAG BOILERS SHALL BE STOPPED AS REQUIRED. THE BOILER CONTROLLER SHALL ENABLE/DISABLE, MONITOR STATUS, AND DISPLAY ALARM SIGNALS FOR FLAME FAILURE ALARM, THE RESPECTIVE BOILER SHALL BE DE-ENERGIZED, THE NEXT BOILER IN THE LEAD/LAG SEQUENCE OF OPERATION SHALL BE ENERGIZED, AND EACH ALARM SHALL BE COMMUNICATED TO THE BAS FOR ALARM/DISPLAY AT THE OPERATOR'S WORKSTATION.

BOILER MOUNTED CONTROLS (BY BOILER MANUFACTURER)

- ALL CONTROLS SHALL BE LOCATED IN A HINGED LOCKING METAL CABINET WITH NEMA 1A ENCLOSURE AND NEOPRENE DUST SEAL. CONTROLS SHALL BE ELECTRONIC. ALL WIRING SHALL BE ELECTRONIC. ALL WIRING SHALL BE COLOR CODED. PROVIDE CONTROL TRANSFORMER, AND FUSING IN ACCORDANCE WITH ALL CODE REQUIREMENTS. PROVIDE DUAL ADJUSTABLE HIGH LIMIT CONTROLS WITH ONE SET AT 190°F WITH MANUAL RESET AND ALARM CONTACT, AND ONE SET AT 180°F WITH AUTO RESET AFTER AN ADJUSTABLE DIFFERENTIAL; ADJUSTA BURNER CONTROLS SHALL HAVE MINIMUM 5:1 TURNDOWN.
- 2. THE SEQUENCE OF BURNER OPERATION SHALL BE CONTROLLED BY A PROGRAMMING RELAY OF THE ELECTRONIC TYPE PROVIDING PRE-PURGE AND WITH FULL PROTECTION AGAINST FLAME FAILURE DURING BOTH IGNITION AND NORMAL BURNER OPERATING PERIODS. OPERATING OF THE PROGRAMMING RELAY SHALL BE GOVERNED BY EXCESS TEMPERATURE LIMIT SWITCH, AN ELECTRONIC FLAME FAILURE PROTECTION DEVICE AND THE LOW WATER CUT-OFF TO SHUT DOWN THE BOILER. AFTER THE SAFETY SHUTDOWN MANUAL RESET SHALL BE REQUIRED. THE BURNER BLOWER CONTROLS SHALL BE INTERLOCKED TO PREVENT BURNER OPERATION WITHOUT FORCED DRAFT. MEANS SHALL BE PROVIDED FOR AUTOMATICALLY DELAYING BURNER OPERATION WHILE ALLOWING FAN TO SCAVENGE BOILER PASSES OF COMBUSTION AIR, FLUE DAMPER, AND ISOLATION VALVE OPEN/CLOSE CONTACTS AND ALARM.

REPORTING FUNCTIONS

HISTORIES/TRENDING

- a. THE BAS SHALL PRINT OUT ANY TEMPERATURE OR DATA FROM ANY SENSOR OR DEFINED VARIABLE ON REQUEST OF OPERATOR. THIS SHALL BE PROVIDED FOR BOTH INDIVIDUAL BOILERS AND COMMON SENSORS
- b. THE BAS SHALL BE PROGRAMMED TO RECORD HISTORIES OF ALL TEMPERATURES (BOILER WATER SUPPLY AND RETURN TEMPERATURES, HOUR OF DAY, HOURS OF OPERATION ASSOCIATED WITH EACH PIECE OF EQUIPMENT. IN ADDITION, RECORD HISTORIES OF ANY OTHER ITEM OVER ANY TIME PERIOD REQUESTED BY OPERATOR. COORDINATE WITH OWNER FOR INITIAL LIST OF HISTORY ITEMS.
- c. THE BAS SHALL PRINT OUT ALL CHANGES IN EQUIPMENT STATUS AS THEY OCCUR d. INITIALLY THE BAS SHALL TREND AND LOG BOILER PLANT CAPACITY (FLOW AT FMT AND DIFFERENTIAL TEMPERATURE BETWEEN MATCHED SENSORS HWST AND HWRT), PUMP SPEED, REMOTE DPT READING, OAT, WHICH BOILERS ARE ON AND AT WHAT CAPACITY, ALONG WITH TIME OF DAY.
- a. ALARM MESSAGES SHALL BE DISPLAYED AND PRINTED AT THE OPERATORS WORKSTATION.

PROVIDE AUTOMATIC RE-START OF BOILER PLANT UPON RETURN TO NORMAL POWER.

- b. IN ADDITION TO THE ALARMS PREVIOUSLY LISTED, ALL SENSORS AND VARIABLES SHALL BE CAPABLE OF HIGH/LOW ALARM POINTS. AS A MINIMUM, THE FOLLOWING SHALL BE ALARMED AFTER APPROPRIATE TIME DELAYS: IF ANY PIECE OF EQUIPMENT IS INDICATED AS OFF WHEN IT SHOULD BE ON.
- IF HWST IS 10 DEGREES ABOVE OR BELOW THE SET POINT DURING HEATING CYCLE. IGNORE THIS ALARM IF CYCLE HAS JUST BEEN STARTED WITHIN 20 MINUTES.
- IF ANY PIECE OF EQUIPMENT IS ON THAT IS INDICATED AS OFF OR FAILS.
- a. PROVIDE OVERALL SYSTEM, INDIVIDUAL BOILER AND PUMP GRAPHICS WITH REAL TIME UPDATING OF CONDITIONS (STATUS, TEMPERATURES, FLOWS, ETC.). b. PROVIDE FLOW DIAGRAMS FOR EVERY SYSTEM WITH ALL INSTRUMENTATION AND DATA (IN SPECIFICATIONS).

1. BAS CONTRACTOR SHALL PROVIDE PROGRAMMING TO PROVIDE A MENU ALLOWING THE OPERATOR TO EASILY OPEN ALL CONTROL VALVES) FOR USE DURING CLEANING/FLUSHING, TESTING AND BALANCING WORK, AND FOR AIR PURGING.

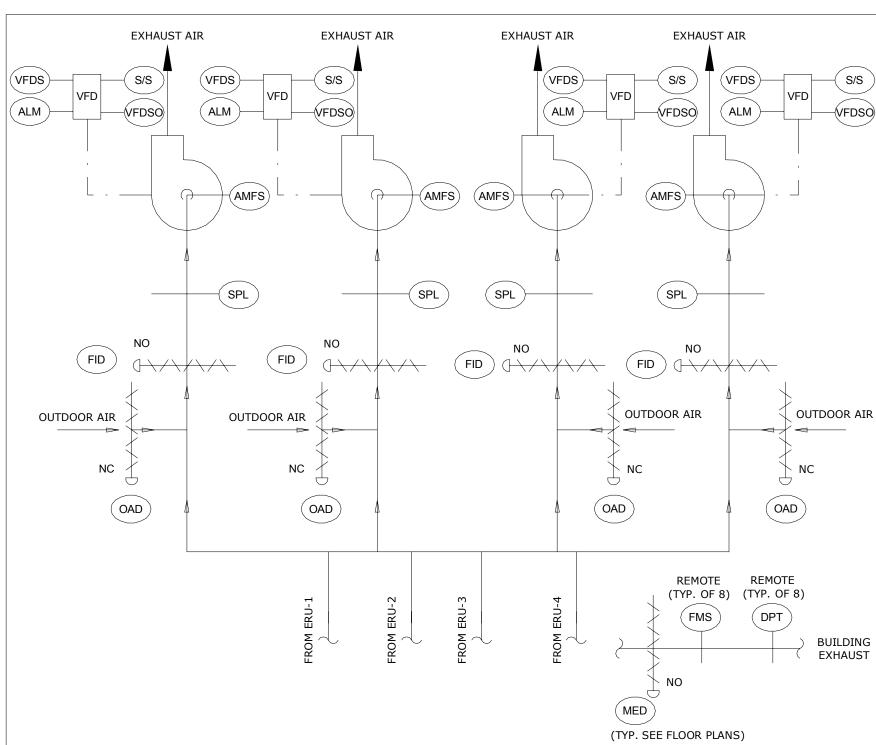
STAND-BY POWER

BOILERS, ALL BOILER CONTROLS, AND THE HW PUMPS SHALL BE ON STANDBY POWER AND SHALL AUTOMATICALLY RESTART AND OPERATE NORMALLY DURING A POWER FAILURE AFTER THE GENERATOR HAS STARTED.

R D K

CONDENSING BOILER PLANT CONTROL / FLOW DIAGRAM AND SEQUENCE OF OPERATION

BLR01



- 1.EACH EXHAUST FAN SHALL BE STARTED, STOPPED, AND CONTROLLED VIA DEDICATED FULLY PROGRAMMABLE DDC CONTROLLER AND SHALL BE CAPAPLE OF STAND-ALONE OPERATION SHOULD ONE FAN OR CONTROLLER FAIL. ALL SET POINTS SHALL BE ADJUSTABLE. ALL ACTUATORS SHALL BE ELECTRONIC. NO = NORMALLY (FAIL) OPEN ON LOSS OF POWER. NC = NORMALLY (FAIL) CLOSED ON LOSS OF POWER. VFD SHALL MODULATE FANSPEED TO MAINTAIN DUCT STATIC PRESSURE IN EACH OF THE 4 EXHAUST DUCTS AS DETERMINED BY BALANCER.
- 2.ALL SAFETIES SHALL BE ACTIVE IN BOTH "H" AND "A" POSITIONS OF THE FAN'S HAND-OFF-AUTOMATIC SWITCHES (H-O-A).
- 3.ALL TEMPERATURES LISTED ARE FAHRENHEIT.
- 4.ALL TEMPERATURE SENSORS IN THE UNIT AND DUCTWORK SHALL BE AVERAGING TYPE.

- 1. THE LEAD EXHAUST FAN SHALL NORMALLY OPERATE CONTINUOUSLY.
- 2. WHILE AN EXHAUST FAN IS EITHER OFF ON SAFETY OR MANUAL DISCONNECT, THE ASSOCIATED OUTSIDE AIR AND FAN ISOLATION DAMPERS (OAD & FID) SHALL BE CLOSED.
- 3. WHEN AN EXHAUST FAN IS TO BE STARTED, THE FID SHALL OPEN AND THE FAN SHALL START AT MINIMUM SPEED.
- 4.THE EXHAUST FAN VFD SHALL SLOWLY INCREASE IN SPEED TO MAINTAIN HIGHEST SETPOINT OF ALL REMOTE EXHAUST DIFFERENTIAL PRESSURE SENSORS (DPT) OF THE CURRENTLY RUNNING ERU'S AS DETERMINED BY BALANCER . INITIAL SETPOINT SHALL BE NEGATIVE 1.0" W.G. WITH FINAL SETPOINT DETERMINED BY THE BALANCING CONTRACTOR.
- 5.EACH ACTIVE FAN SHALL MAINTAIN A MINIMUM 3,000 FPM EXIT VELOCITY, BASED ON IT'S AIRFLOW MEASURING STATION (AFMS), BY SLOWLY MODULATING THE ASSOCIATED OAD OPEN AS REQUIRED.
- 6.THE LEAD AND STANDBY EXHAUST FANS SHALL BE ROTATED BIWEEKLY.

MAIN EXHAUST DAMPERS (TYP OF 8).

- 1.MAIN EXHAUST DAMPERS (MED) SHALL ALL MODULATE TO THE OPEN POSITION UPON THE START OF THE FAN. DAMPERS WILL THEN CLOSE RESPECTIVELY UPON DETECTION OF UNOCCUPIED SPACES ASSOCIATED WITH THOSE DAMPERS.
- 2. WHILE A ROOM IS OCCUPIED AND THE ASSOCIATED ERU IS RUNNING THE MAIN EXHAUST DAMPER (MED) ASSOCIATED WITH THAT ERU SHALL MODULATE TO MAINTAIN THE FLOW AS PREVIOUSLY BALANCED. THE DUPLEX EXHAUST FAN SET SHALL MODULATE TO MAINTAIN THE CFM REQUIRED BY ALL ACTIVE ZONES AS TOTALED BY THEIR RESPECTIVE FLOW MEASURING STATIONS (FMS)
- 3. WHILE A ROOM IS UNOCCUPIED AND THE ASSOCIATED ERU IS OFF, THE MAIN EXHAUST DAMPER (MED) ASSOCIATED WITH THOSE SYSTEMS

EXHAUST FAN FAILURE OR MAINTENANCE SHUTDOWN

1.IF THE LEAD EXHAUST FAN FAILS, STOPS ON A SAFETY TRIP, OR IS SHUTDOWN FOR ROUTINE MAINTENANCE, A STANDBY EXHAUST FAN SHALL BE STARTED AFTER IT'S EAD OPENS AND SHALL OPERATE UNDER NORMAL CONTROL.

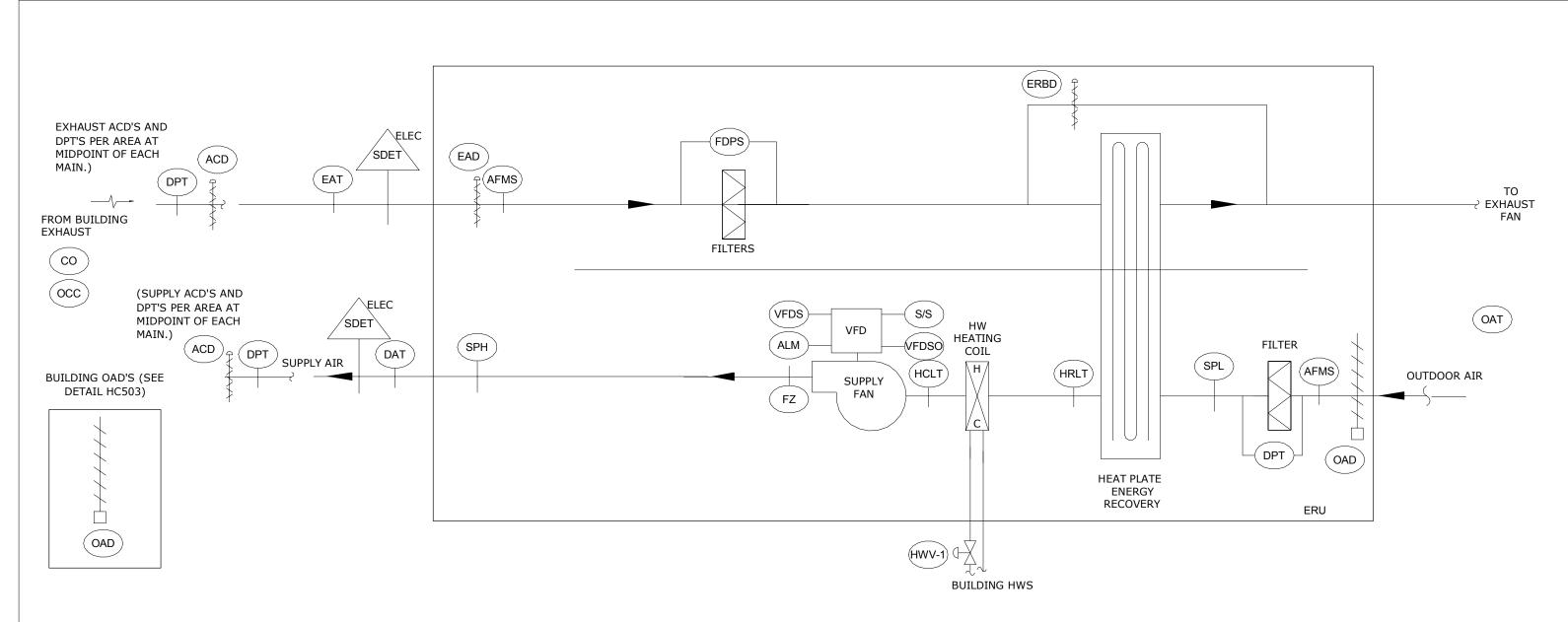
- 1.THE FOLLOWING SAFETY, WITH ITS OWN MANUAL RESET BUTTON, SHALL SHUT DOWN THE ASSOCIATED EXHAUST FAN BEFORE THE H-O-A.
- a. WHEN THE PRESSURE AT STATIC PRESSURE LOW LIMIT (SPL) DROPS BELOW NEGATIVE 4 INCHES W.G.
- b. ON TOTAL FAILURE OF ALL ERU'S.
- 6.IF AN EXHAUST FAN FAILS OR IF ANY SAFETY IS TRIPPED, THE EXHAUST FAN'S CONTROLLER SHALL GIVE A DETAILED ALARM SIGNAL TO THE FRONT END.

STAND-BY POWER

1.UNIT AND ALL COMPONENTS AND CONTROLS SHALL BE WIRED TO STAND-BY POWER. PROVIDE AUTOMATIC RE-START UPON POWER FAILURE AND UPON RETURN TO NORMAL POWER.

> QUADRA PLEX EXHAUST FAN AIR CONTROL SEQUENCES (EF-1A,1B,1C,1D)

118-0167 THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE **ROCKY HILL** SHEETS IS BASED ON LIMITED **STATE OF CONNECTICUT** DRAWING NO. TFC REPAIR FACILITY INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE **MEC-500** DRAWING TITLE THE CONDITIONS OF ACTUAL QUANTITIES **DEPARTMENT OF TRANSPORTATION** OF WORK WHICH WILL BE REQUIRED. **MECHANICAL CONTROLS I** 1/8" = 1'-0"10.28 Revision Description File Name: MPFP_CTDOT_Rocky Hill Repair Facility_Central.rvt Plotted: 10/21/2014 3:31:54 PM



GENERAL

- 1. EACH AIR HANDLING UNIT SHALL BE STARTED, STOPPED, AND CONTROLLED VIA DEDICATED FULLY PROGRAMMABLE DDC CONTROLLER AND SHALL BE CAPAPLE OF STAND-ALONE OPERATION. UNITS SHALL OPERATE WHEN ASSOCIATED SPACES ARE EITHER OCCUPIED (AS DETERMINED BY OCCUPANCY SENSORS [OCC]), MANUAL OVER RIDE BY USER COMMAND, OR AT BUILDING SCHEDULED TIMES (ADJ.). ALL SET POINTS SHALL BE ADJUSTABLE. ALL ACTUATORS SHALL BE ELECTRONIC. NO = NORMALLY (FAIL) OPEN ON LOSS OF POWER. NC = NORMALLY (FAIL) CLOSED
- 2. ALL SAFETIES SHALL BE ACTIVE IN BOTH "H" AND "A" POSITIONS OF THE FAN'S HAND-OFF-AUTOMATIC SWITCHES (H-O-A).
- 3. ALL TEMPERATURES LISTED ARE FAHRENHEIT.
- 4. ALL TEMPERATURE SENSORS IN THE UNIT AND DUCTWORK SHALL BE AVERAGING TYPE.

- 1. WHILE AN AHU IS EITHER OFF ON SAFETY OR MANUAL DISCONNECT, THE AHU SUPPLY FAN SHALL BE OFF WITH THE OUTSIDE AIR AND UNIT DISCHARGE AIR DAMPERS (OAD & EAD) CLOSED.
- 2. THE HEATING COIL CONTROL VALVE (HWV) SHALL ALWAYS (WHETHER THE AHU IS OFF OR ON) BE CONTROLLED BY THE HEATING COIL LEAVING AIR TEMPERATURE SENSOR (HCLT) TO MAINTAIN 70°F LEAVING AIR TEMPERATURE IN THE CASING.
- 3. WHEN AN AHU IS TO BE STARTED, THE OAD AND DAD SHALL OPEN AND THE SUPPLY FAN SHALL START AT MINIMUM SPEED AFTER PROOF OF DAMPER OPENING.
- 4. THE SUPPLY FAN VFD SHALL SLOWLY INCREASE IN SPEED TO MAINTAIN SETPOINT OF REMOTE SUPPLY DIFFERENTIAL PRESSURE SENSOR (DPT). INITIAL SETPOINT SHALL BE 1.0" W.G. WITH FINAL SETPOINT DETERMINED BY THE BALANCING CONTRACTOR TO BE AS LOW AS NEEDED TO PROVIDE FULL AIRFLOW TO THE FURTHEST DIFFUSER WITH THE OPPOSING BLADE DAMPERS AT LEAST 90% OPEN.
- 5. EVERY DPT SHALL HAVE ITS SETPOINT MET AT ALL TIMES.

HEATING CONTROL

- 1. UPON A DROP IN DISCHARGE AIR TEMPERATURE (AT DAT) BELOW THE DAT SET POINT OF 70°F, DAT SHALL MODULATE HEATING CONTROL VALVE TO MAINTAIN DAT SETPOINT AT 70-75°F (ADJ).
- 2. THE FIRST STAGE OF HEATING SHALL BE THE HEAT PLATE. WHEN OA IS COOLER THAN EXHAUST AIR TEMPERATURE AS MEASURED AT EXHAUST AIR TEMPERATURE SENSOR (EAT), HRLT SHALL MODULATE THE ENERGY RECOVERY BYPASS DAMPER (ERBD) CLOSED AS REQUIRED TO MAINTAIN SET POINT. WHEN ADDITIONAL HEATING IS NEEDED, ERBD SHALL REMAIN CLOSED AND THE HEATING COIL HEATING WATER VALVE (HWV) SHALL BE MODULATED OPEN AS REQUIRED. THE REVERSE SHALL OCCUR ON A RISE IN HCLT ABOVE HEATING SET POINT.

EXHAUST CONTROL DAMPER CONTROL 1.SEE EXHAUST FAN SEQUENCES FOR EXHAUST CONTROL DAMPER (ECD) CONTROL

BYPASS MODE

1. WHEN THE OAT IS ABOVE 65°F (ADJ.) THE EXHAUST AIR DAMPER (EAD) SHALL SHUT AND THE ENERGY RECOVERY BYPASS DAMPER (ERBD) SHALL OPEN SIMULTANEOUSLY. THE REVERSE SHALL OCCUR UPON A DROP IN OUTDOOR AIR TEMPERATURE (OAT) BELOW 60°F (ADJ.). ONCE THE OAD'S IN THE BUILDING SPACES HAVE BEEN PROVED OPEN, THE SUPPLY FAN SHALL BE COMMANDED OFF, AND THE OAD FOR THE UNIT SHALL SHUT.

PURGE MODE

1. UPON A CO ALARM IN A SPACE SERVED BY AN ERU, THE ASSOCIATED ERU SHALL BE COMMANDED ON AND TO RUN AT MAXIMUM CAPACITY FOR AFFECTED ZONE . THE UNIT SHALL ALARM AT THE BMS AND UNIT SHALL AUTOMATICALLY RESET WHEN THE CO ALARM CEASES.

AHU FAILURE OR MAINTENANCE SHUTDOWN

1. IF ANY AHU FAILS, STOPS ON A SAFETY TRIP, OR IS SHUTDOWN FOR ROUTINE MAINTENANCE, THE REMAINING AHU'S SHALL RAMP UP IN SPEED (WITHIN 30 SECONDS) TO SUPPLY 100% OF THE REQUIRED AIRFLOW

SAFETIES

1. THE FOLLOWING SAFETIES, EACH WITH ITS OWN MANUAL RESET BUTTON, SHALL SHUT DOWN THE AHU BEFORE THE H-O-A.

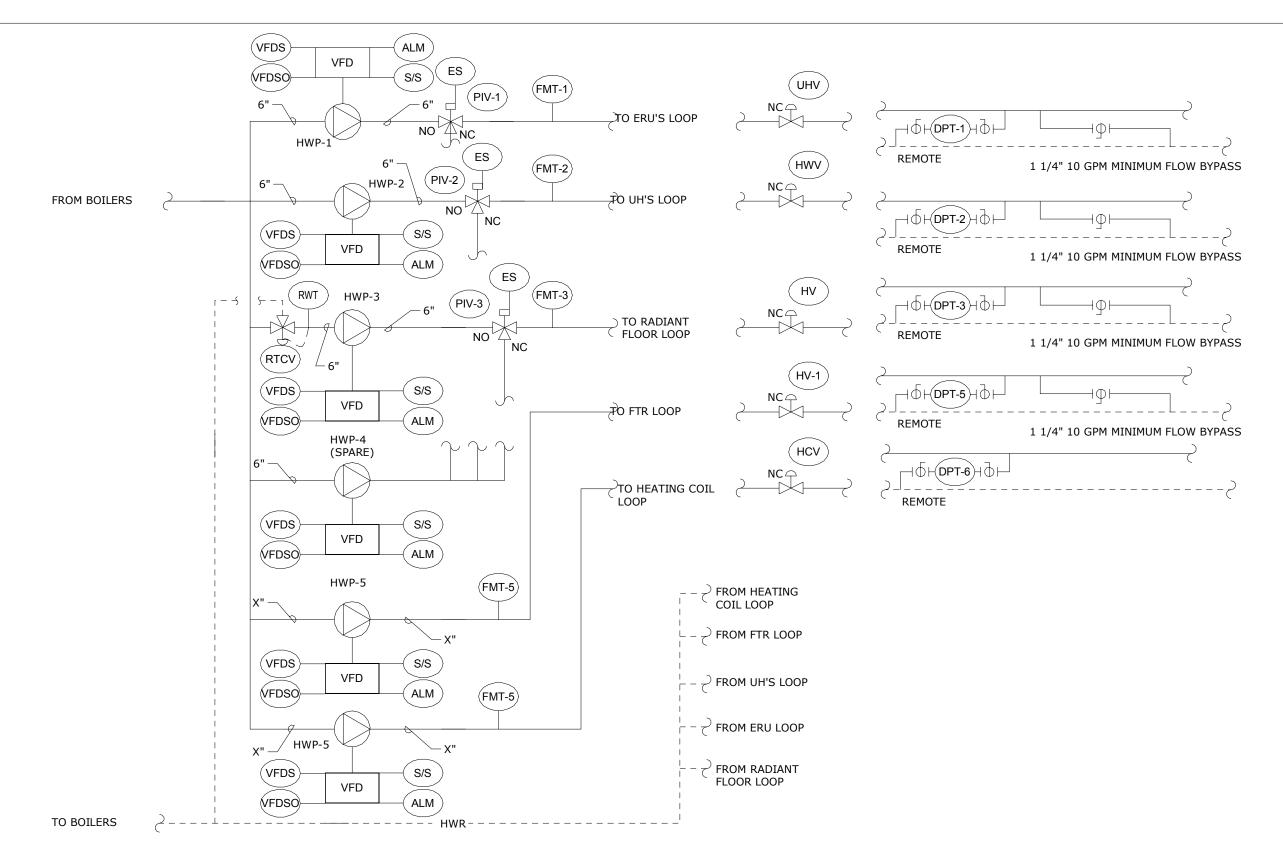
- a. WHEN THE SMOKE DETECTOR (SDET) IS ACTIVATED.
- b. WHEN THE PRESSURE AT STATIC PRESSURE HIGH LIMIT (SPH) RISES ABOVE 4 INCHES W.G.
- c. WHEN THE PRESSURE AT STATIC PRESSURE LOW LIMIT (SPL) DROPS BELOW NEGATIVE 4 INCHES W.G.
- d. ON TOTAL FAILURE OF PRIMARY EXHAUST SYSTEM, AHU SHALL SHUT DOWN

ALARMS

Revision Description

- 1. IF THE SUPPLY FAN FAILS OR IF ANY UNIT SAFETY IS TRIPPED, THE AHU CONTROLLER SHALL GIVE A DETAILED ALARM SIGNAL TO THE FRONT END.
- 2. IF, FOR 10 MINUTES, A PRE-FILTER PRESSURE DROP EXCEEDS SET POINT (INITIALLY 0.6") OR THE FINAL-FILTER PRESSURE DROP EXCEEDS SET POINT (INITIALLY 1.0"), THE AHU CONTROLLER SHALL GIVE A DETAILED ALARM SIGNAL TO THE FRONT END. 3. IF THE OUTDOOR AIR TEMPERATURE IS BELOW 35°F, UPON FAILURE OF BOILER PLANT OR HWP-2, AN ALARM SHALL BE SENT TO THE FRONT END. THE UNITS SHALL ENTER STANDBY MODE AND THE OUTDOOR AIR DAMPER (OAD) AND EXHAUST AIR DAMPER (EAD) SHALL BE SHUT.
- STAND-BY POWER 1. UNIT FAN AND CONTROLS SHALL BE WIRED TO STAND-BY POWER. PROVIDE RE-START UPON POWER FAILURE AS INDICATED IN EMERGENCY OPERATION CONTROL SEQUENCES AND UPON RETURN TO NORMAL POWER.

GENERAL SUPPLY AIR HANDLING UNIT WITH HEAT-PLATE ENERGY RECOVERY CONTROL SEQUENCES (ERU-1,2,3,4)



EACH PUMP SHALL BE STARTED, STOPPED, AND CONTROLLED VIA DEDICATED FULLY PROGRAMMABLE DDC CONTROLLER AND SHALL BE CAPABLE OF STAND-ALONE OPERATION. ALL SET POINTS SHALL BE ADJUSTABLE.

- ALL ACTUATORS SHALL BE ELECTRONIC. NO = NORMALLY (FAIL) OPEN ON LOSS OF POWER. NC = NORMALLY (FAIL) CLOSED ON LOSS OF POWER.
- ALL SAFETIES SHALL BE ACTIVE IN BOTH "H" AND "A" POSITIONS OF THE HAND-OFF-AUTOMATIC SWITCHES (H-O-A). ALL TEMPERATURE SENSORS SHALL BE AVERAGING TYPE.

- UPON A CALL FOR HEAT BY ANY UNIT HEATER CONTROL VALVE (UHV), HWP-1 SHALL START ONCE END SWITCH (ES) IS PROVEN OPEN.
- PUMP SHALL MODULATE ITS VFD TO MAINTAIN BALANCED DESIGN SETPOINT AT REMOTE DIFFERENTIAL PRESSURE SENSORS (DPT-1) LOCATED ON THE FURTHEST RUN OF EQUIPMENT. UPON PUMP FAILURE, AN ALARM SHALL BE SENT TO THE BMS.
- IF FMT-1 READS ZERO FLOW AND ASSOCIATED PUMP IS LISTED AS RUNNING, AN ALARM SHALL BE SENT TO THE BMS AND THE PUMP SHALL SHUT DOWN.

- UPON A CALL FOR HEAT BY ANY ERU HEATING WATER VALVE (HWV), HWP-2 SHALL START ONCE END SWITCH (ES) IS PROVEN OPEN. PUMP SHALL MODULATE ITS VFD TO MAINTAIN BALANCED DESIGN SETPOINT AT REMOTE DIFFERENTIAL PRESSURE SENSORS (DPT-2) LOCATED ON MEZZANINE ABOVE.
- UPON PUMP FAILURE, AN ALARM SHALL BE SENT TO THE BMS AND THE ERU'S SHALL ENTER STANDBY MODE. UPON FAILURE OF ALL ERU'S , PUMP SHALL ENTER STANDBY MODE.
- IF FMT-2 READS ZERO FLOW AND ASSOCIATED PUMP IS LISTED AS RUNNING, AN ALARM SHALL BE SENT TO THE BMS AND THE PUMP SHALL SHUT DOWN.

RADIANT FLOOR PUMP CONTROLS (HWP-3)

- UPON A CALL FOR HEAT BY ANY RADIANT FLOOR VALVE (RWV), HWP-3 SHALL START ONCE END SWITCH (ES) IS PROVEN OPEN.
- PUMP SHALL MODULATE ITS VFD TO MAINTAIN BALANCED DESIGN SETPOINT AT REMOTE DIFFERENTIAL PRESSURE SENSORS (DPT-3) LOCATED ON THE FURTHEST RUN OF EQUIPMENT.
- UPON PUMP FAILURE, AN ALARM SHALL BE SENT TO THE BMS AND THE ERU'S SHALL ENTER STANDBY MODE.
- RADIANT TEMPERATURE CONTROL VALVE SHALL MODULATE AS REQUIRED TO MAINTAIN 107° LEAVING WATER TEMPERATURE AS SENSED AT RADIANT WATER TEMPERATURE SENSOR (RWT). IF FMT-3 READS ZERO FLOW AND ASSOCIATED PUMP IS LISTED AS RUNNING, AN ALARM SHALL BE SENT TO THE BMS AND THE PUMP SHALL SHUT DOWN.

SPARE PUMP CONTROLS (HWP-4)

- UPON FAILURE OF ONE OTHER PUMP, THE 3-WAY, 2 POSITION PUMP ISOLATION VALVE (PIV) ASSOCIATED WITH THAT PUMP SHALL SWITCH THE NORMALLY OPEN AND NORMALLY CLOSED SIDES OF THE VALVE. THE SPARE PUMP (HWP-4) SHALL THEN START. THIS SEQUENCE SHALL SEND A NOTIFICATION TO THE BMS AND SHALL BE FULLY REVERSIBLE ON USER COMMAND.
- PUMP SHALL MODULATE ITS VFD TO MAINTAIN BALANCED DESIGN SETPOINT FOR THE SYSTEM BEING BACKED UP AT REMOTE DIFFERENTIAL PRESSURE SENSOR (DPT) LOCATED ON THE FURTHEST RUN OF EQUIPMENT. UPON PUMP FAILURE, AN ALARM SHALL BE SENT TO THE BMS.
- IF THE ASSOCIATED SYSTEM'S FMS READS ZERO FLOW AND ASSOCIATED PUMP IS LISTED AS RUNNING, AN ALARM SHALL BE SENT TO THE BMS AND THE PUMP SHALL SHUT DOWN.

FIN TUBE RADIATION (FTR) PUMP CONTROLS (HWP-5)

- UPON A CALL FOR HEAT BY ANY FTR ZONE VALVE (HV-1), HWP-5 SHALL START. PUMP SHALL MODULATE ITS VFD TO MAINTAIN BALANCED DESIGN SETPOINT AT REMOTE DIFFERENTIAL PRESSURE SENSORS (DPT-5) LOCATED ON THE FURTHEST RUN OF EQUIPMENT.
- UPON PUMP FAILURE, AN ALARM SHALL BE SENT TO THE BMS.
- 4. IF FMT-5 READS ZERO FLOW AND ASSOCIATED PUMP IS LISTED AS RUNNING, AN ALARM SHALL BE SENT TO THE BMS. AND THE PUMP SHALL SHUT DOWN.

HEATING COIL PUMP CONTROLS (HWP-6)

- UPON A CALL FOR HEAT BY HEATING COIL VALVE (HCV), HWP-6 SHALL START. PUMP SHALL MODULATE ITS VFD TO MAINTAIN BALANCED DESIGN SETPOINT AT REMOTE DIFFERENTIAL PRESSURE SENSORS (DPT-6) LOCATED ON THE FURTHEST RUN OF EQUIPMENT.
- UPON PUMP FAILURE, AN ALARM SHALL BE SENT TO THE BMS. 4. IF FMT-6 READS ZERO FLOW AND ASSOCIATED PUMP IS LISTED AS RUNNING, AN ALARM SHALL BE SENT TO THE BMS. AND THE PUMP SHALL SHUT DOWN.

PROVIDE ALARM ON FAILURE TO MEET SETPOINT FOR 10 MINUTES OR ANY EQUIPMENT FAILURE

HEATING WATER PUMP CONTROL SEQUENCES R|D|K

HWC01

SHEETS IS BASED ON LIMITED IN NO WAY WARRANTED TO INDICATE OF WORK WHICH WILL BE REQUIRED.

DESIGNER/DRAFTER THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE INVESTIGATIONS BY THE STATE AND IS THE CONDITIONS OF ACTUAL QUANTITIES

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STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION File Name: MPFP_CTDOT_Rocky Hill Repair Facility_Central.rvt



REPAIR FACILITY

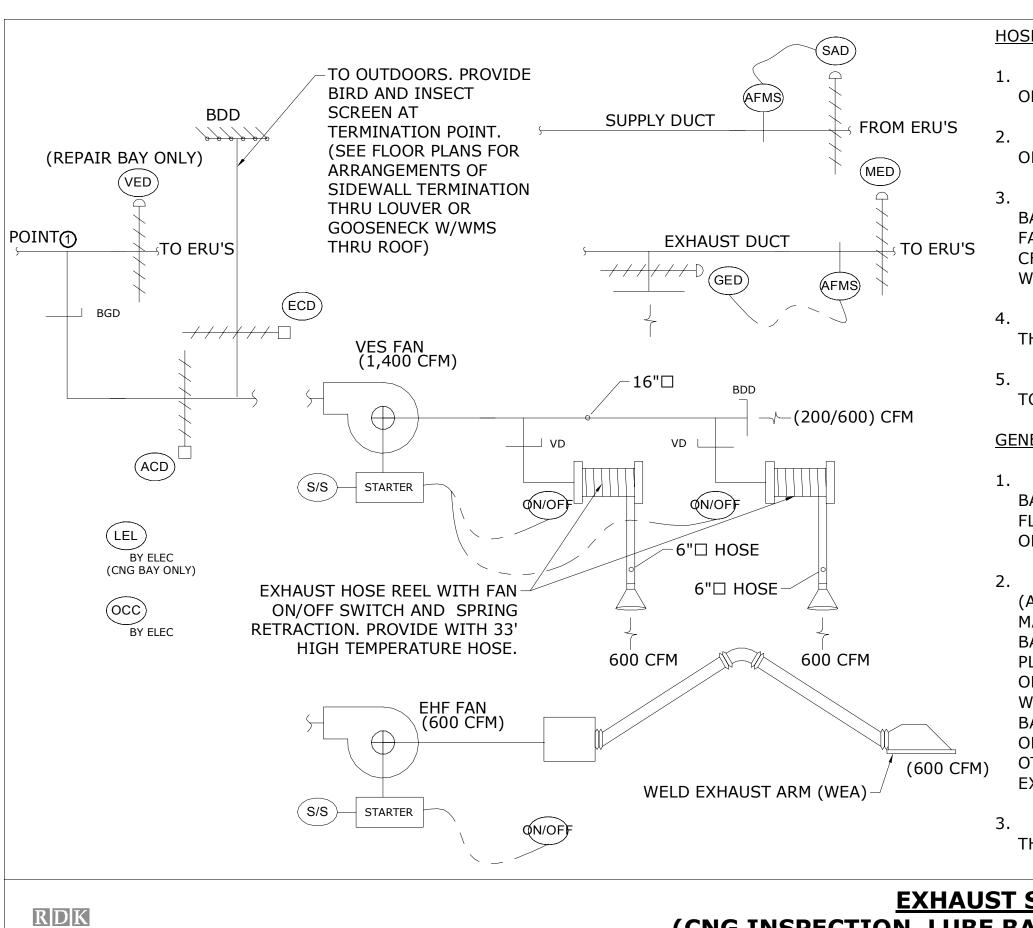
ROCKY HILL

MEC-501

118-0167

10.29

MECHANICAL CONTROLS II



HOSE REELS AND VES FANS

- WHEN BOTH HOSE REELS ARE RETRACTED THE VES FAN SHALL BE OFF.
- WHILE EITHER HOSE REEL IS IN USE, FAN SHALL BE COMMANDED ON TO RUN AT BALANCED VALUE OF 1400 CFM.
- 3. COUNTER BALANCED BACKDRAFT DAMPER (BDD) SHALL BE BALANCED FOR NO MORE THAN 200 CFM LEAKAGE WHILE THE VES FAN IS RUNNING AND BOTH VES HOSE REELS ARE EXHAUSTING 600 CFM EACH. THE BACKDRAFT DAMPER SHALL PROVIDE 600 CFM OF AIR WHILE ONLY ONE ASSOCIATED EXHAUST HOSE IS IN USE.
- PROVIDE HARDWARE, WIRING, PROGRAMMING, AND GRAPHICS TO THE BUILDING BAS.
- THE BLAST GATE DAMPER (BGD) SHALL BE MANUALLY BALANCED TO ENSURE THE PRESSURE AT POINT 1 IS ALWAYS NEGATIVE.

GENERAL EXHAUST DAMPER (GED)

- THE GENERAL EXHAUST DAMPER (GED) SHALL BE INITIALLY BALANCED FOR FULL GENERAL EXHAUST FLOW (AS SHOWN ON THE FLOOR PLANS) WITH ALL ASSOCIATED VES AND EHF FANS IN THE OFF POSITION.
- 2. UNDER NORMAL OPERATION THE AIR FLOW MEASURING STATION (AFMS) SHALL MODULATE THE GENERAL EXHAUST DAMPER (GED) TO MAINTAIN THE CFM GENERAL EXHAUST FLOW (WHICH WAS INITIALLY BALANCED AS DESCRIBED ABOVE), LESS THE ANY/ALL (SEE FLOOR PLANS FOR SPECIFIC CASE) OF THE FOLLOWING TOTALS: 1) OPERATING VEHICLE EXHAUST SYSTEM (VES) 2) CONSTANT VOLUME WELDING HOODS 3) EXHAUST HOOD FAN (EHF). IN THE MAIN REPAIR BAY, THE EXHAUST AIR FLOW FROM THE MAIN REPAIR BAY SHALL BE OBTAINED BY TAKING THE AFMS READING IN THAT ZONE LESS ALL OTHER EXHAUST ZONES CURRENTLY IN OPERATION ON THE SAME EXHAUST MAIN.
- PROVIDE HARDWARE, WIRING, PROGRAMMING, AND GRAPHICS TO THE BUILDING BAS.

ACD AND ECD

- ACD SHALL BE NORMALLY OPEN. ECD SHALL BE NORMALLY CLOSED.
- 2. UPON FAILURE OR SHUTDOWN OF THE MAIN EXHAUST FANS, EMERGENCY CONTROL DAMPER (ECD) SHALL OPEN, AUTOMATIC CONTROL DAMPER (ACD) SHALL SHUT. UPON MAIN EXHAUST FAN RE-START, DAMPERS SHALL RESUME NORMAL OPERATION.
- 3. WHILE THE LOCAL VENTILATION FAN (VF) IS IN OPERATION THE ACD SHALL BE SHUT, AND ECD SHALL BE OPEN.

MED - MAIN EXHAUST DAMPER

1. WHILE ASSOCIATED VENTILATION FAN (VF) IS IN OPERATION, OR THE ZONE IS UNOCCUPIED AS DETERMINED BY OCCUPANCY SENSOR (OCC) THE MAIN EXHAUST DAMPER (MED) SHALL BE SHUT.

SAD - SUPPLY AIR DAMPER

- 1. WHILE ASSOCIATED VENTILATION FAN (VF) IS IN OPERATION, OR THE ZONE IS UNOCCUPIED AS DETERMINED BY OCCUPANCY SENSOR (OCC) THE SUPPLY AIR DAMPER (SUPPLY AIR) SHALL BE SHUT.
- 2. UPON A ZONE BECOMING ACTIVE DUE TO OCCUPANCY OR NORMAL SCHEDULING, SAD SHALL MODULATE OPEN. AFMS SHALL MODULATE SAD TO MAINTAIN BALANCED AIRFLOW FOR THE ZONE AFFECTED.

VED - VEHICLE EXHAUST DAMPER (MAIN REPAIR BAY ONLY)

- 1. WHILE THE VEHICLE EXHAUST SYSTEMS ARE NOT IN OPERATION, THE VEHICLE EXHAUST DAMPER SHALL BE SHUT.
- 2. IF A VEHICLE EXHAUST SYSTEM FAN IS ON, AND THE ASSOCIATED ECD IS SHUT, VED SHALL MODULATE OPEN.

LOWER EXPLOSIVE LIMIT (LEL) SEQUENCE (CNG BAY ONLY)

1. UPON LEL DETECTION. ASSOCIATED MED SHALL OPEN FULLY, AND SAD SHALL OPEN FULLY. ERU'S AND MAIN EXHAUST FANS SHALL PROVIDE/EVACUATE PURGE AIR AT ROOM BALANCE VALUE UNTIL LEL HAS BEEN SILENCED.

GENERAL:

- 1. THE HEATER SHALL BE CONTROLLED BY A SPACE TEMPERATURE SENSOR (WHERE NO TO INDICATED ON PLANS).
 - 2. THE HEATER SHALL BE CONNECTED INTO THE BUILDING AUTOMATION SYSTEM (BAS) FOR ALARMS. ALARM NOTIFICATIONS SHALL BE SENT TO BAS IF THE EQUIPMENT FAILS OR IF TEMPERATURE FALLS BELOW 50°F FOR 10 MINUTES.
 - 3. PROVIDE HARDWARE, WIRING, PROGRAMMING, AND GRAPHICS TO THE BUILDING BAS.

SEQUENCE:

HEATER (CUH)

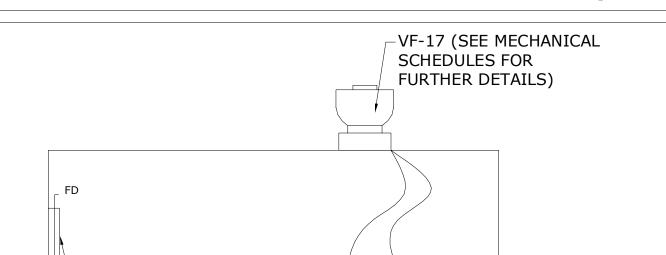
SEQUENCE OF OPERATION

1. ON A CALL FOR HEATING FROM SPACE TEMPERATURE SENSOR (60°F), THE TEMPERATURE SENSOR SHALL:

HOT WATER UNITS: OPEN THE HEATING VALVE (HV). UPON PROOF OF HOT WATER FLOW AS SENSED BY A TEMPERATURE SENSOR (TS) SET AT 90°F, THE FAN SHALL BE TURNED ON TO MAINTAIN SPACE TEMPERATURE SETTING WITH AN ADJUSTABLE 3°F DIFFERENTIAL.

THE REVERSE SHALL OCCUR UPON A RISE IN TEMPERATURE

EXHAUST SYSTEMS SEQUENCE OF OPERATION (CNG INSPECTION, LUBE BAYS, WELDING, MAIN REPAIR BAYS, AERIAL BUCKET)



ON/OFF

(TR)

GENERAL:

R|D|K

THE FAN SHALL BE CONTROLLABLE BY ROOM LOCAL ON/OFF SWITCH, BMS, OR T-STAT.

CONTROLS SEQUENCE

IF TR IS GREATER THAN 70 DEGREES. FAN SHALL RUN.

24 X 24 SMOKE/FIRE

DUCT WITH WMS

DAMPER AND TRANSFER

UPON A DROP IN TEMPERATURE BELOW TR SET POINT. FAN SHALL TURN OFF.

VF-7 SEQUENCE OF OPERATION

UPON FAILURE TO START, AN ALARM SHALL BE SENT TO THE FRONT END.

STARTER -(s/s) (TR)OUTDOOR AIR TEMPERATURE.

GENERAL:

- THE HEATER FAN SHALL BE CONTROLLED BY A SPACE TEMPERATURE SENSOR (WHERE INDICATED ON PLANS).
- 2. THE HEATER SHALL BE CONNECTED INTO THE BUILDING AUTOMATION SYSTEM (BAS) FOR ALARMS. ALARM NOTIFICATIONS SHALL BE SENT TO BAS IF THE EQUIPMENT FAILS OR IF TEMPERATURE FALLS BELOW 50°F FOR 10 MINUTES.
- PROVIDE HARDWARE, WIRING, PROGRAMMING, AND GRAPHICS TO THE BUILDING BAS.
 - 4. WHERE APPLICABLE THE HEATER SPACE TEMPERATURE SENSOR CAN ALSO CONTROL RADIANT FLOOR HEATING. 5. UNIT HEATERS AND RADIANT HEATING SHALL BE LOCKED OUT DURING VENTILATION FAN OPERATION ABOVE 65°F

SEQUENCE:

ON A CALL FOR HEATING FROM SPACE TEMPERATURE SENSOR (60°F), THE TEMPERATURE SENSOR SHALL:

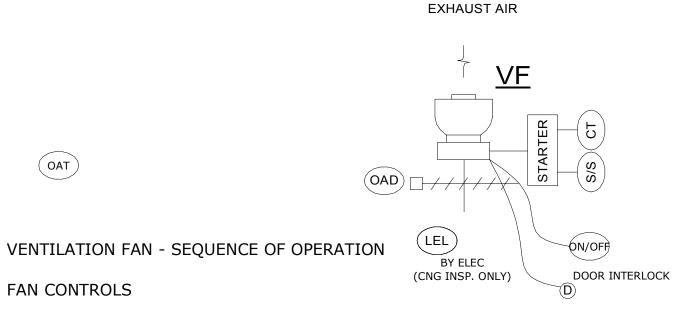
HOT WATER UNITS

- 1. THE FAN SHALL BE TURNED ON TO MAINTAIN SPACE TEMPERATURE SETTING WITH AN ADJUSTABLE 3°F DIFFERENTIAL.
- 2. THE REVERSE SHALL OCCUR UPON A RISE IN **TEMPERATURE**
- UPON AN ASSOCIATED GARAGE DOOR BEING OPEN FOR 10 MINS (ADJ). THE BMS SHALL SHUT THE UH FAN OFF. UPON GARAGE DOOR BEING CLOSED THE UH FAN SHALL RESET TO NORMAL OPERATION. THIS SHALL BE TYPICAL OF ALL AREAS EXCEPT THE MAIN REPAIR BAYS WHERE UH FANS WILL RUN CONSTANTLY OFF OF SPACE TEMPERATURE
- 4. <u>CNG BAY ONLY</u> UPON ACTIVATION OF LEL ALL UH'S IN CNG BAY SHALL SHUT DOWN.

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HEATER (UH)

SEQUENCE OF OPERATION

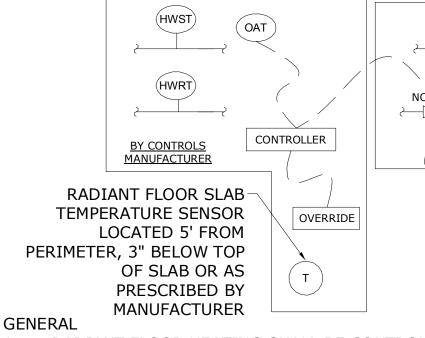


- FAN SYSTEM SHALL BE CONTROLLED BY THE DDC SYSTEM OR ROOM MOUNTED ON/OFF SWITCH.
- PROVIDE FAN FAILURE ALARM (CT) AND HIGH TEMP ALARM AT 104°F (FOR 10 MINUTES).
- 3. DAMPER SHALL BE RUSKIN CD51 LOW-LEAKAGE TYPE, OR APPROVED **EQUAL**
- UNIT HEATERS AND RADIANT HEATING SHALL BE LOCKED OUT DURING VENTILATION FAN OPERATION ABOVE 65°F OUTDOOR AIR TEMPERATURE.
- 5. LOCAL ROOM MOUNTED ON/OFF SWITCH SHALL ALLOW USER TO TURN FAN ON. WHEN SWITCH IS IN THE ON POSITION OR GARAGE DOOR BEING OPENED, THE OAD SHALL OPEN AND THE VF SHALL START. UPON SWITCH BEING IN THE OFF POSITION THE REVERSE SHALL OCCUR.
- 6. EACH FAN SHALL BE TIED TO A DOOR INTERLOCK. WHEN THE ASSOCIATED DOOR IS OPEN, THE FAN SHALL BE ON. THE FAN SHALL BE OFF WHEN THE DOOR IS CLOSED.
- 7. (CNG INSPECTION BAY ONLY) UPON LEL DETECTION. OAD SHALL OPEN AND VF SHALL RUN AT FULL SPEED UNTIL LEL IS SILENCED OR MANUALLY OVERRIDDEN.

VENTILATION FAN (VF)

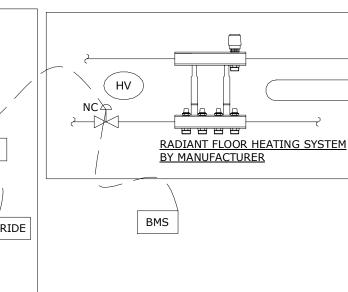
CONTROL SEQUENCES

PROJECT TITLE



STARTER S/S

TR



- RADIANT FLOOR HEATING SHALL BE CONTROLLED BY AN APPLICATION SPECIFIC CONTROLLER (ASC). COORDINATE OCCUPIED/UNOCCUPIED SCHEDULES WITH OWNER. ALL SETPOINTS SHALL BE ADJUSTABLE. ALL ACTUATORS SHALL BE ELECTRONIC.
- ALL TEMPERATURES LISTED ARE FAHRENHEIT AND SHALL BE ADJUSTABLE. MANIFOLD SHALL BE BALANCED TO PROVIDE FOR EVEN FLOW THROUGH EACH INDIVIDUAL PIPE RUN.
- RADIANT HEATING SHALL BE LOCKED OUT DURING VENTILATION FAN OPERATION ABOVE 65°F (ADJ) OUTDOOR AIR TEMPERATURE.

CONTROL VALVE CONTROL

VES01

R D K

- 1. CONTROL VALVE SHALL MODULATE OPEN TO MAINTAIN SLAB TEMPERATURE SETPOINT (ADJ.). INITIALLY THE SLAB TEMPERATURE SHALL BE SET MAINTAIN 70°F WHEN THE OUTDOOR AIR IS BELOW 54°F. AT OUTDOOR AIR TEMPERATURES ABOVE 55°F THE VALVE SHALL BE SHUT AND CIRCULATING PUMP (HWP-3) SHALL BE OFF.
- CONTROL VALVE SHALL MODULATE OPEN WHEN COMMANDED BY SLAB TEMPERATURE SENSOR PROVIDED EXCLUSIVELY FOR RADIANT FLOORING OR BY BAS SETPOINT DEPENDENT ON OUTDOOR AIR TEMPERATURE (OAT) WITH AN INITIAL SET POINT OF 54°F (ADJ.) OR BY LOCAL OVERRIDE.

HC503 R|D|K

RADIANT FLOOR CONTROLS SEQUENCES

DRAWING TITLE

FCUV-1

PROJECT NO.

118-0167

HC802

Revision Description Date

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE HEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

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STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION

HC801

R|D|K



ROCKY HILL

DRAWING NO. **MEC-502**

MECHANICAL CONTROLS III

10.30

WJS TFC SCALE

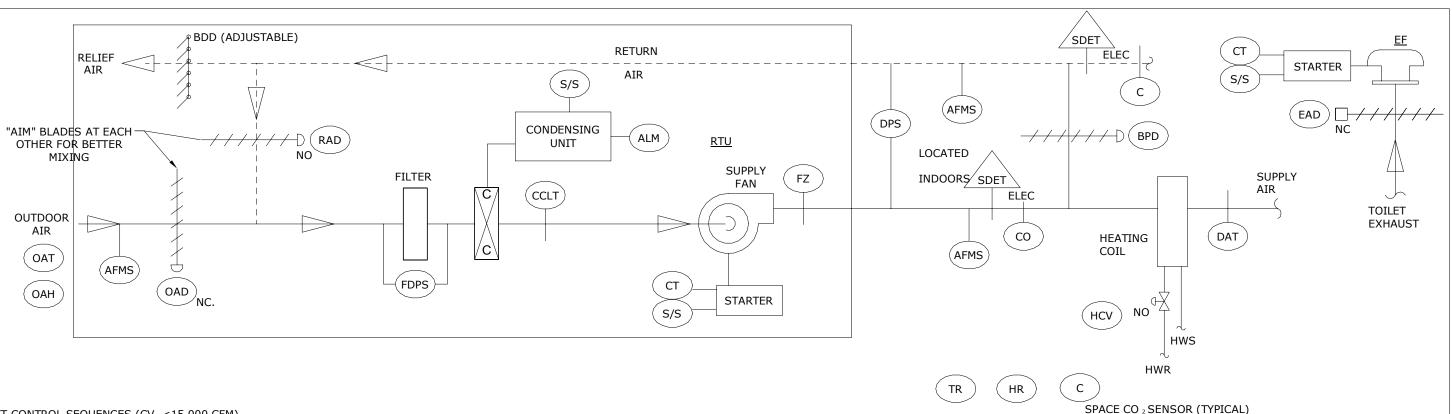
HC803

RDK

DESIGNER/DRAFTER

1/8" = 1'-0"

REPAIR FACILITY



ROOFTOP UNIT CONTROL SEQUENCES (CV, <15,000 CFM)

ROOF TOP UNIT CONTROLS

- ROOFTOP UNIT AND EXHAUST FAN SHALL BE STARTED AND STOPPED VIA DDC CONTROLLER. COORDINATE OCCUPIED AND UNOCCUPIED SCHEDULES WITH OWNER. ALL SETPOINTS SHALL BE ADJUSTABLE. ALL ACTUATORS SHALL BE ELECTRONIC.
- LOCAL HAND-OFF-AUTOMATIC SWITCH (H-O-A) FOR FANS SHALL OVERRIDE DDC START/STOP (S/S) COMMANDS. ALL HARDWIRED SAFETIES SHALL BE ACTIVE IN BOTH "H" AND "A" POSITIONS.
- 3. ALL TEMPERATURES LISTED ARE FAHRENHEIT.
- ALL TEMPERATURE SENSORS IN THE UNIT AND DUCTWORK SHALL BE AVERAGING TYPE EXCEPT FOR FREEZESTATS WHICH SHALL BE LOW POINT READING TYPE.
- PROVIDE APPROPRIATE ANTI-RECYCLE TIME DELAYS AND SAFETIES ON COMPRESSOR AND GAS HEATER STAGING.

FAN CONTROL

- WHILE IN UNOCCUPIED MODE (OR OFF ON SAFETY OR MANUAL DISCONNECT) THE SUPPLY AND EXHAUST FAN (EF) SHALL BE OFF WITH THE OUTSIDE AIR DAMPER (OAD) AND EXHAUST AIR DAMPER (EAD) CLOSED, THE CONDENSING UNIT AND GAS HEATER OFF, AND THE RETURN AIR DAMPER (RAD) OPEN.
- WHEN STARTED IN OCCUPIED MODE, THE SUPPLY FAN SHALL START IN RECIRCULATION MODE, THEN THE OAD AND RAD SHALL OPEN TO THE MINIMUM OUTDOOR AIR POSITION AS CONTROLLED BY AIR FLOW MONITORING STATION (AFMS - SEE CO2 CONTROL), THE EAD SHALL OPEN, AND THE EXHAUST FAN (EF) SHALL START.

OCCUPIED CARBON DIOXIDE CONTROL

- THE ACTUAL MINIMUM OUTDOOR AIRFLOW SHALL VARY BETWEEN 40% AND 100% OF THE SCHEDULED MINIMUM OUTDOOR AIR VOLUME. NORMAL MINIMUM OUTDOOR AIR (OA) QUANTITY SHALL BE CONTROLLED BY THE OUTDOOR AIR AFMS TO 40% OF THE SCHEDULED MINIMUM OA. IF EITHER OF THE FOLLOWING OCCURS, THE OUTDOOR AIR AFMS SHALL SLOWLY MODULATE THE OAD AND RAD AS REQUIRED TO MAINTAIN THE MAXIMUM CO2 WITHIN 50 PPM OF THE LISTED LIMIT:
- IF ANY VARIABLE OCCUPANCY SPACE CO2 SENSOR SERVED BY THE UNIT RISES ABOVE THE LIMIT OF 1200 PPM FOR 5 MINUTES.

IF THE RETURN AIR CO2 LEVEL AT SENSOR (C) RISES

ABOVE LIMIT OF 1000 PPM.

 $\mathbb{R}[\mathbb{D}]\mathbb{K}$

- DURING OCCUPIED PERIODS, THE SUPPLY FAN SHALL RUN CONTINUOUSLY AND THE OUTSIDE AIR DAMPER SHALL OPEN TO MAINTAIN MINIMUM VENTILATION REQUIREMENTS UNLESS THE DEMAND VENTILATION OR ECONOMIZING SEQUENCES ARE ACTIVE. THE RETURN DAMPER WILL BE INVERSELY INTERLOCKED WITH THE OUTDOOR AIR DAMPER.
- THE DX COOLING SHALL STAGE AND HOT WATER HEAT SHALL MODULATE TO MAINTAIN THE CURRENT DISCHARGE AIR TEMPERATURE SETPOINT COMPARED TO A SPACE SETPOINT AND THE AMOUNT OF HEAT OR COOL CALLS. IF ECONOMIZING IS ENABLED THE OUTSIDE AIR DAMPER SHALL MODULATE TO MAINTAIN THE CURRENT DISCHARGE AIR TEMPERATURE SETPOINT.
- THE SUPPLY AIR SENSOR SHALL MEASURE THE DRY BULB TEMPERATURE OF THE AIR LEAVING THE EVAPORATOR COIL WHILE ECONOMIZING. WHEN ECONOMIZING IS ENABLED AND THE UNIT IS OPERATING IN THE COOLING IF THE OUTSIDE AIR ENTHALPY RISES ABOVE THE ROOM AIR ENTHALPY THE ECONOMIZER SHALL BE POSITIONED TO PROVIDE MINIMUM OUTDOOR AIRFLOW AND THE CONDENSING UNIT STAGED TO MAINTAIN ROOM COOLING SETPOINT TEMPERATURE. DAT SHALL LIMIT SUPPLY AIR TO 48°F MINIMUM, DURING MECHANICAL COOLING.
- THE TRACER SC WILL POLL THE SPACE SENSORS AND COMPARE THE TEMPERATURES WITH ITS INDIVIDUAL SETPOINT
- IF THE MAJORITY OF THE SPACE REQUIRES COOLING THE RTU WILL ENABLE THE D/X COOLING TO START. THE D/X COOLING WILL REMAIN "ON" UNTIL THE SPACE SENSORS REACH SETPOINT, AT WHICH TIME THE RTU WILL CYCLE THE D/X COOLING TO
- IF THE MAJORITY OF THE SPACE REQUIRES HEATING THE RTU WILL ENABLE THE HOT WATER HEATING COIL AND MODULATE HEATING COIL VALVE (HCV) AS REQUIRED TO MAINTAIN DISCHARGE AIR TEMP (DAT). THE HEAT WILL REMAIN "ON" UNTIL THE SPACE SENSORS REACH SETPOINT, AT WHICH TIME THE RTU WILL CYCLE "OFF".

OCCUPIED BYPASS:

THE BAS SHALL MONITOR THE STATUS OF THE "ON" AND "CANCEL" BUTTONS OF THE SPACE TEMPERATURE SENSORS. WHEN AN OCCUPIED BYPASS REQUEST IS RECEIVED FROM A SPACE SENSOR, THE UNIT SHALL TRANSITION FROM ITS CURRENT OCCUPANCY MODE TO OCCUPIED BYPASS MODE AND THE UNIT SHALL MAINTAIN THE SPACE TEMPERATURE TO THE OCCUPIED SETPOINTS (ADJ.).

BYPASS DAMPER CONTROL

WHEN THE SUPPLY FAN IS ON, THE BYPASS DAMPER (BPD) WILL SLOWLY OPEN, AND MODULATE TO MAINTAIN THE PROPER DISCHARGE DUCT STATIC PRESSURE SETPOINT AS DETERMINED BY (DPS). DETERMINATION OF THE DISCHARGE DUCT STATIC PRESSURE SETPOINT WILL BE PER THE DISCHARGE DUCT STATIC PRESSURE SETPOINT SECTION OF THE RTU SYSTEM LEVEL OPERATION SECTION OF THIS SEQUENCE.

UNOCCUPIED CONTROL

- WHEN THE AVERAGE SPACE TEMPERATURE IS BELOW THE UNOCCUPIED HEATING SETPOINT OF 60.0 DEG. F (ADJ.) THE SUPPLY FAN SHALL OPERATE, THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED AND THE HEATING COIL VALVE (HCV)
- WHEN THE AVERAGE SPACE TEMPERATURE RISES ABOVE THE UNOCCUPIED HEATING SETPOINT OF 60.0 DEG. F (ADJ.) PLUS THE UNOCCUPIED DIFFERENTIAL OF 4.0 DEG. F (ADJ.) THE SUPPLY FAN SHALL STOP AND THE HEATING COIL SHALL
- 3. WHEN THE AVERAGE SPACE TEMPERATURE IS ABOVE THE UNOCCUPIED COOLING SETPOINT OF 85.0 DEG. F (ADJ.) THE SUPPLY FAN, THE OUTSIDE AIR DAMPER SHALL OPEN IF ECONOMIZING IS ENABLED AND REMAIN CLOSED IF ECONOMIZING IS DISABLED AND THE DX COOLING SHALL BE ENABLED.
- 4. WHEN THE AVERAGE SPACE TEMPERATURE FALLS BELOW THE UNOCCUPIED COOLING SETPOINT OF 85.0 DEG. F (ADJ.) MINUS THE UNOCCUPIED DIFFERENTIAL OF 4.0 DEG. F (ADJ.) THE SUPPLY FAN SHALL STOP, THE DX COOLING SHALL BE DISABLED AND THE OUTSIDE AIR DAMPER SHALL CLOSE.

1. DDC CONTROLLER SHALL PROVIDE OPTIMUM START CAPABILITY. IF SPACE TEMPERATURE IS BELOW 63°F, WARM-UP SHALL BE DONE WITH RAD OPEN, OAD CLOSED, AND GAS HEATER CONTROLLED BY DAT TO SUPPLY 90°F AIR. WHEN ROOM TEMPERATURE RISES ABOVE 69°F, OCCUPIED MODE SHALL START. EF SHALL REMAIN OFF WITH EAD CLOSED.

- IN ADDITION TO THE CO SAFETY SHOWN ABOVE (FOR BUILDINGS WITH RESIDENTIAL UNITS), THE FOLLOWING SAFETIES EACH WITH ITS OWN MANUAL RESET BUTTON, SHALL SHUT DOWN THE UNIT VIA HARDWARE BEFORE H-O-A.
- a. ANY FREEZESTAT (FZ) SHALL SHUTDOWN THE UNIT WHENEVER THE TEMPERATURE IS LESS THAN 35°F.
- b. WHEN ANY SMOKE DETECTOR (SDET) IS ACTIVATED THE UNIT SHALL SHUT DOWN

ALARMS

ROOFTOP UNIT CONTROL SEQUENCES (CV, <15,000 CFM)

- IF EITHER THE SUPPLY OR EXHAUST FAN FAILS OR IF ANY SAFETY IS TRIPPED, THE DDC CONTROLLER SHALL GIVE A DETAILED ALARM SIGNAL TO THE FRONT END.
- IF FILTER PRESSURE DROP EXCEEDS SETPOINT (INITIALLY 0.6") FOR 10 MINUTES, THE DDC CONTROLLER SHALL GIVE A DETAILED ALARM SIGNAL TO THE FRONT END.

(ACD DUCTWORK → INDOOR OUTSIDE LOUVER - TOP OF BLOCK WALL OVER DOOR - BLOCK WALL 2. DAMPER SHALL BE RUSKIN CD51 LOW-LEAKAGE TYPE, OR APPROVED EQUAL.

— 24"☐ GREENHECK GRSR RELIEF WITH

- 1. ACD SHALL MODULATE AS REQUIRED TO MAINTAIN A DIFFERENTIAL PRESSURE OF +/- 0.05" W.C. BETWEEN INTERIOR AND EXTERIOR SPACES.

CONTROL NOTES:

99999

BDD

BY PAINT BOOTH VENDOR

CONTROL NOTES:

LOUVER 4 (LV-4) CONTROL DETAIL

INSECT SCREEN

24"X24"-

AIR COMPRESSOR

HC002

ROOF

VD

500 CFM TYP. (3)

HALL

24"X24"

__

PAINT EQUIP ROOM

b. SETPOINT CONTROL THE BAS WILL EDIT THE ZONE SPACE TEMPERATURE SETPOINT OF EACH VAV BOX. INDIVIDUAL ZONE SETPOINT AND CONTROL LOGIC WILL RESIDE AT THE ZONE LEVEL, AND NOT BE DEPENDENT UPON THE BAS FOR CONTROL. IN THE EVENT OF COMMUNICATION LOSS, THE BOX WILL CONTINUE TO CONTROL TO DEFAULT SETPOINTS. c. COOLING STAGES CONTROL THE BAS WILL CONTROL THE COOLING DAMPER TO A FULLY OPEN, FULLY

VAV BOX WITH HW COIL, CO2, AND RADIATION CONTROL SEQUENCES

BASEBOARD RADIATION SHALL BE FIRST MODE OF HEATING.

SEQUENCE OF OPERATION: VAV TERMINAL UNITS

MINIMUM GROUP TEMPERATURE

MAXIMUM GROUP TEMPERATURE AVERAGE GROUP TEMPERATURE

CLOSED, MAXIMUM, OR MINIMUM POSITION BASED ON OPERATOR COMMANDS. THE OPERATOR WILL ALSO HAVE THE CAPABILITY TO ADJUST THE MAXIMUM & MINIMUM POSITIONS THROUGH THE BAS.

<u>VAV</u>

A DDC VAV ZONE DAMPER CONTROLLER PER VAV TERMINAL UNIT WILL INDIVIDUALLY CONTROL THE

THE BAS WILL PERFORM THE FOLLOWING VAV TERMINAL UNIT CONTROL STRATEGIES AND PROVIDE

GROUPS WILL MAKE IT POSSIBLE FOR THE OPERATOR TO SEND A COMMON COMMAND TO ALL BOXES IN A GROUP TO OPERATE IN THE SAME MODE. BAS WILL ALSO COMPILE ON A GROUP BASIS, THE FOLLOWING:

THE POINTS AS LISTED ON THE DDC/VAV POINT LIST AND THE SPECIFIED MONITORING AND

a. GROUPING _ THE BAS WILL BE ABLE TO GROUP VAV BOXES VIA KEYBOARD COMMANDS. THESE

BASEBOARD RADIATION

d. OPERATING MODE _ THE BAS WILL PLACE THE ZONE IN EITHER THE OCCUPIED OR UNOCCUPIED MODE BASED ON AN OPERATOR ADJUSTABLE TIME SCHEDULE. SEPARATE HEATING & COOLING SETPOINTS WILL BE ENTERABLE FOR EACH MODE THROUGH THE BAS. OTHER MODES AVAILABLE FOR SPECIAL APPLICATIONS WILL INCLUDE FULL OPEN OR FULL CLOSED.

e. CONTROL OFFSET _ THE BAS WILL BE CAPABLE OF OFFSETTING THE COOLING OR HEATING SETPOINTS OF ONE OR MORE GROUPS OF BOXES BY AN OPERATOR ADJUSTABLE AMOUNT. THIS CAPABILITY WILL ALLOW FOR AUTOMATIC ZONE SETPOINT CHANGES BASED ON SYSTEM REQUIREMENTS, SUCH AS DEMAND

f. OVERRIDE BUTTON THE VAV ZONE WILL BE CAPABLE OF BEING PLACED IN THE "OCCUPIED" MODE BY PRESSING AN OVERRIDE BUTTON MOUNTED ON THE ZONE TEMPERATURE SENSOR. THIS IS TO ONLY BE ON THE SENSOR FOR THE CLERK OFFICE 103.

h. ZONE STATUS REPORTS _ FOR EACH ZONE, THE BAS WILL PROVIDE AN OPERATING STATUS SUMMARY

OF ALL UNIT SENSED VALUES (ZONE TEMPERATURE, ETC.), SETPOINTS, AND MODES. ZONE GROUP REPORT _ FOR EACH GROUP OF VAV ZONES, THE BAS WILL REPORT THE GROUP MODE, DAMPER POSITION, AVERAGE ZONE TEMPERATURE, MINIMUM ZONE TEMPERATURE, AND MAXIMUM ZONE TEMPERATURE. THE REPORT WILL ALSO DISPLAY FOR EACH TERMINAL UNIT IN THE GROUP THE PRESENT TEMPERATURE CONTROL SETPOINTS AND THE CURRENT ZONE TEMPERATURE.

PRIMARY

A. GENERAL

a. THE ZONE SENSOR WILL BE ACCURATE TO WITHIN 0.5 F. THE SENSOR WILL BE A PRODUCT OF THE VAV BOX CONTROLS MANUFACTURER AND DESIGNED SPECIFICALLY FOR THE INSTALLED CONTROLLER.

a. IF ZONE TEMPERATURE SENSOR INPUT FAILS ABOVE ITS HIGH RANGE, UNIT WILL CONTROL AT ITS MAXIMUM POSITION. IF SENSOR INPUT FAILS BELOW ITS LOW RANGE, UNIT WILL CONTROL TO ITS

b. IN BOTH CASES, A DIAGNOSTIC MESSAGE WILL BE DISPLAYED UPON OPERATOR INQUIRY. IF POSITION INDICATION FAILS, DIAGNOSTIC MESSAGE WILL BE DISPLAYED UPON OPERATOR INQUIRY.

a. IF ZONE TEMPERATURE SETPOINT POTENTIOMETER ON ZONE SENSOR FAILS, UNIT WILL AUTOMATICALLY CONTROL TO PROGRAMMED OCCUPIED SETPOINTS. DIAGNOSTIC MESSAGE WILL BE DISPLAYED UPON OPERATOR INQUIRY.

(VCD)

- 1. UPON A RISE IN OUTDOOR AIR TEMPERATURE ABOVE 65°F BYP SHALL MODULATE CLOSED AND ACD
- 2. T-STAT IN HALLWAY SHALL MODULATE DAMPERS TO MAINTAIN SPACE TEMPERATURE SET POINT.
- 3. WHILE AIR COMPRESSOR IS ON, EXHAUST FAN (EF-4) SHALL RUN AT BALANCED VALUE OF 3,000 CFM
- 4. WHEN PAINT EQUIP ROOM TEMP EXCEEDS 70°F (ADJ.) VENTILATION CONTROL DAMPER (VCD) SHALL OPEN. FAN SHALL RUN TO MAINTAIN TEMPERATURE SET POINT. UPON A DROP IN TEMPERATURE BELOW 70°F (ADJ). VCD SHALL SHUT AND FAN SHALL TURN OFF.

VARIABLE AIR VOLUME BOX WITH HOT WATER HEATING COIL, CO2, AND RADIATION CONTROL SEQUENCES

PAINT EQUIP ROOM CONTROLS HC002

GENERATOR AIR COMPRESSOR FAN VFD'S AIR DRYER RTU VAV BOXES UPS / PANELS CONTROL VALVES CONTROL DAMPERS COMPRESSORS TOILET EXHAUST **BLOCK HEATERS** OVERHEAD DOORS LEL/GAS DETECTION UNIT HEATERS PUMPS FIRE PUMP PRESSURES/TEMPS DOM. HW CIRC. PUMPS 1. REFER TO CONTROLS SEQUENCES ON PLUMBING, FIRE PROTECTION, HVAC, AND ELECTRICAL PLANS FOR ADDITIONAL

POINTS AND DETAILS. HVAC CONTROLS CONTRACTOR RESPONSIBLE FOR ALL HARDWARE AND SOFTWARE NECESSARY FOR MONITORING OF POINTS LISTED ABOVE AND IN CONTROLS SEQUENCES. ALL POINTS SHALL MONITOR START, STOP AND STATUS. 3. ALL POINTS SHALL BE TRENDABLE AND ACCESSIBLE THRU BAS

4. TERMS BAS - BUILDING AUTOMATION SYSTEM, AND BMS- BUILDING MANAGEMENT SYSTEM SHALL BE INTERCHANGEABLE

ADDITIONAL BAS CONTROL POINTS

HC893

– EF/VF (SEE MECHANICAL - WRH TYPE GRAVITY VENTILATOR (SEE SCHEDULES FOR FURTHER MECHANICAL SCHEDULES FOR DETAILS) FURTHER DETAILS.) (T-STAT) QN/OFF

TYPICAL FOR LV-1, 2,3,6 AND EF-3,EF-5,VF-13,VF-14

THE FAN SHALL BE CONTROLLED BY ROOM LOCAL ON/OFF

GRAVITY VENTILATOR / EF / VF CONTROL

SEQUENCE OF OPERATION

HC803

Revision Description

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE HEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED. Plotted: 10/21/2014 3:31:58 PM

WJS TFC 1/8" = 1'-0"

DESIGNER/DRAFTER

STATE OF CONNECTICUT **DEPARTMENT OF TRANSPORTATION**

ROCKY HILL

118-0167 DRAWING NO. **MEC-503**

MECHANICAL CONTROLS IV

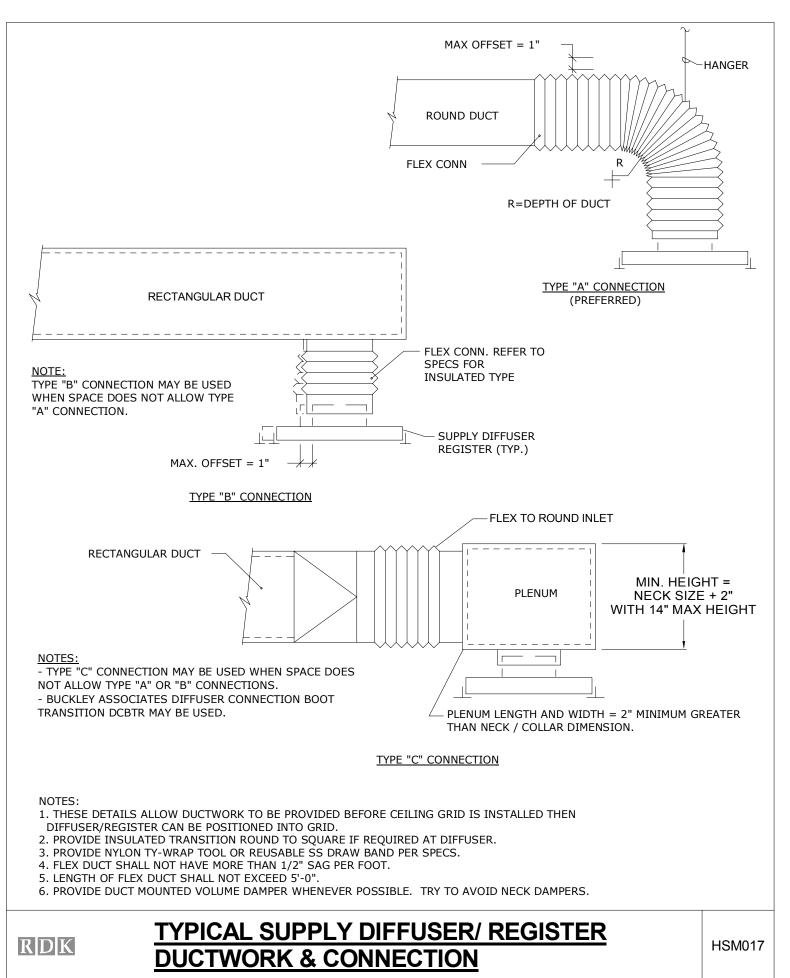
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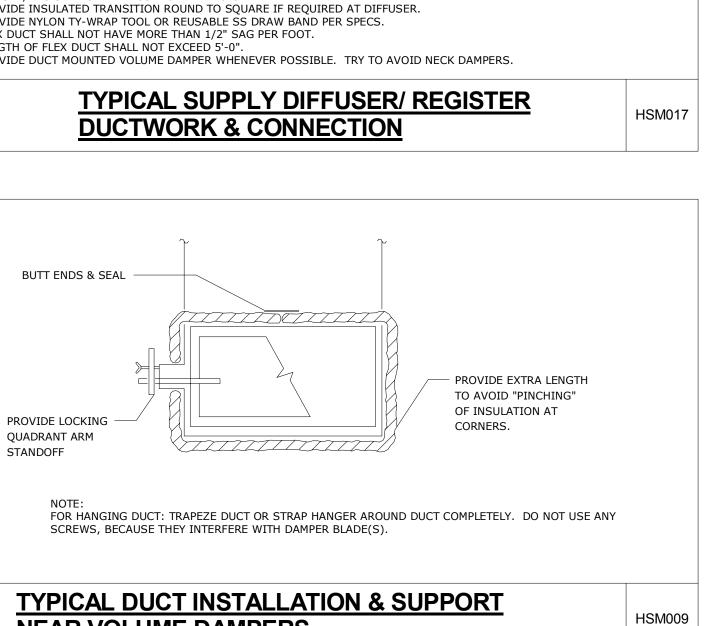
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R|D|K

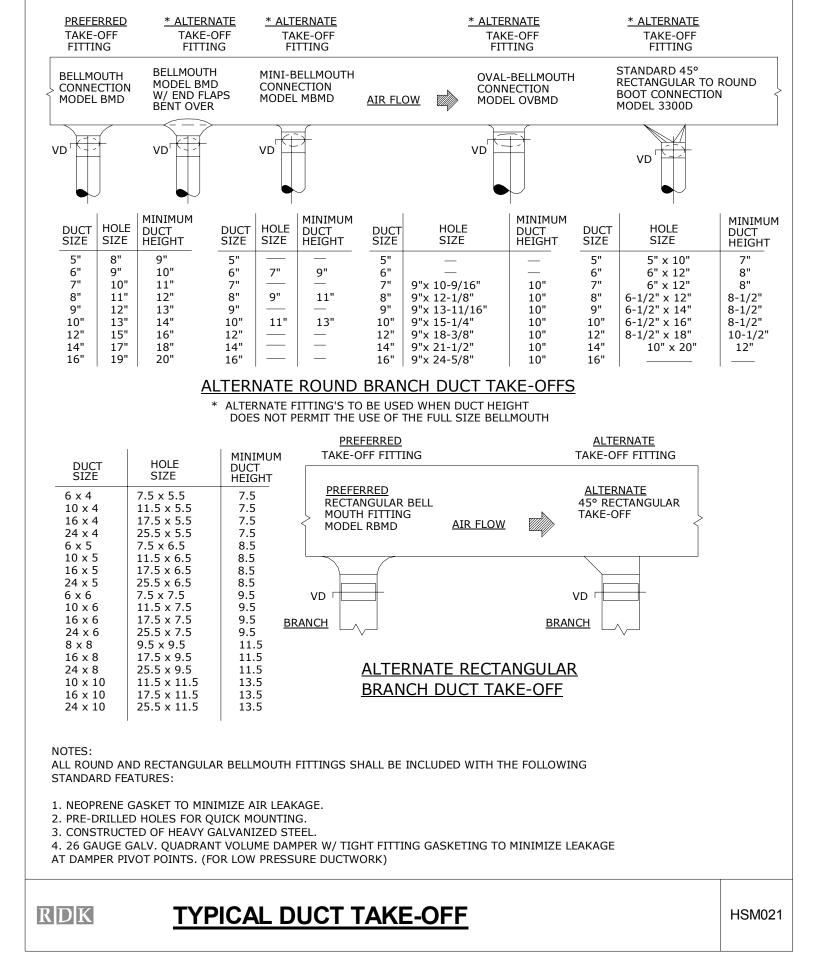
HC002

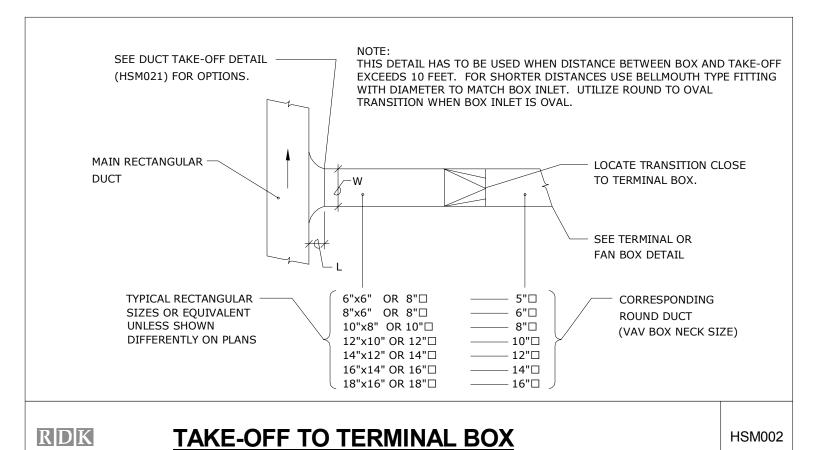
REPAIR FACILITY

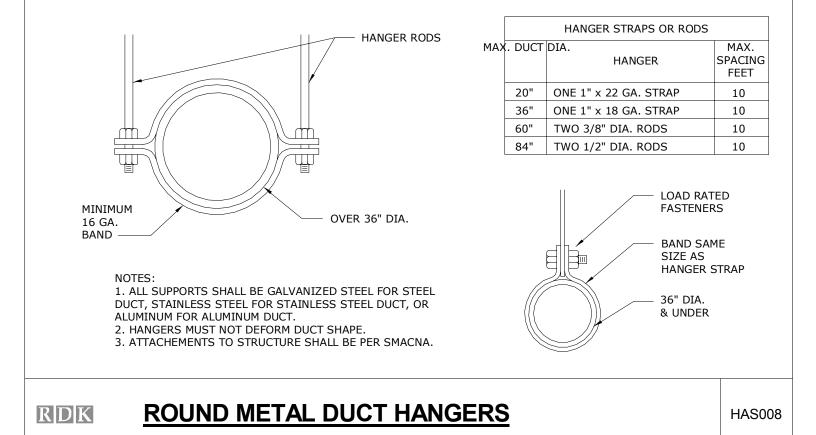


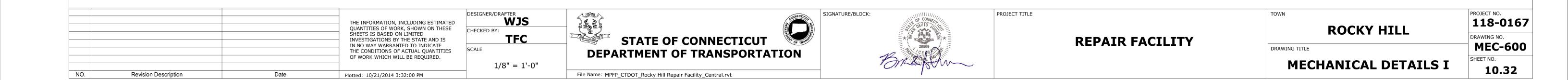


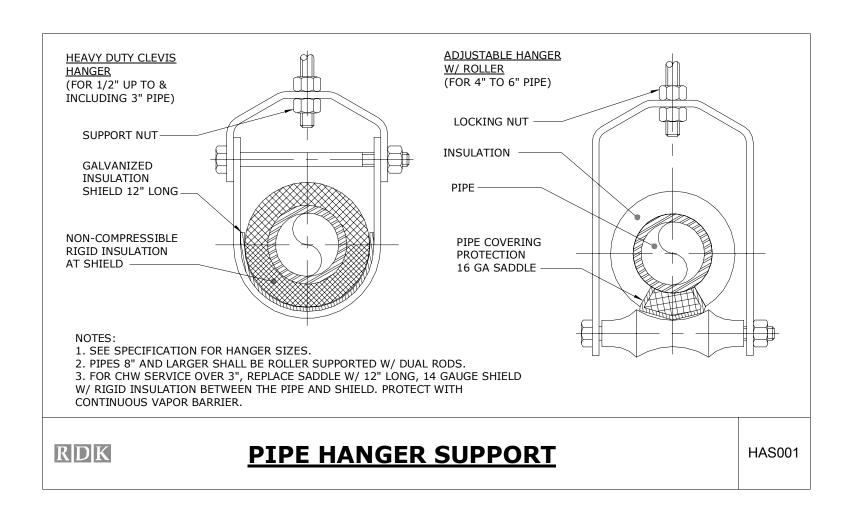
NEAR VOLUME DAMPERS

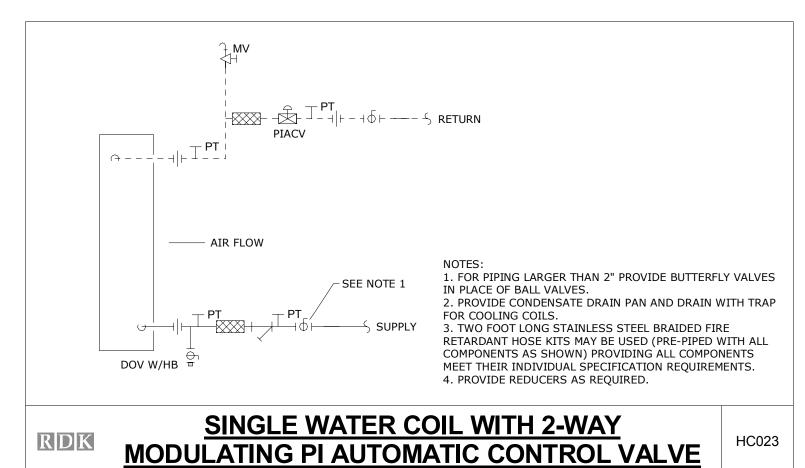


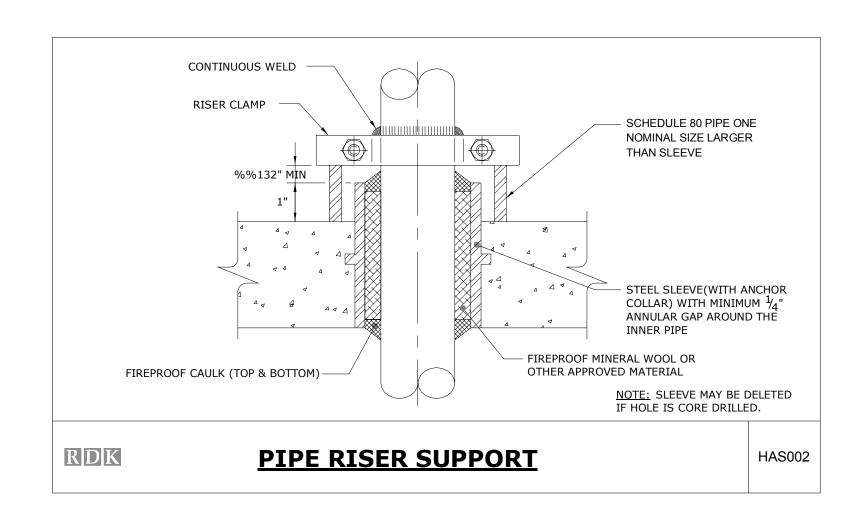


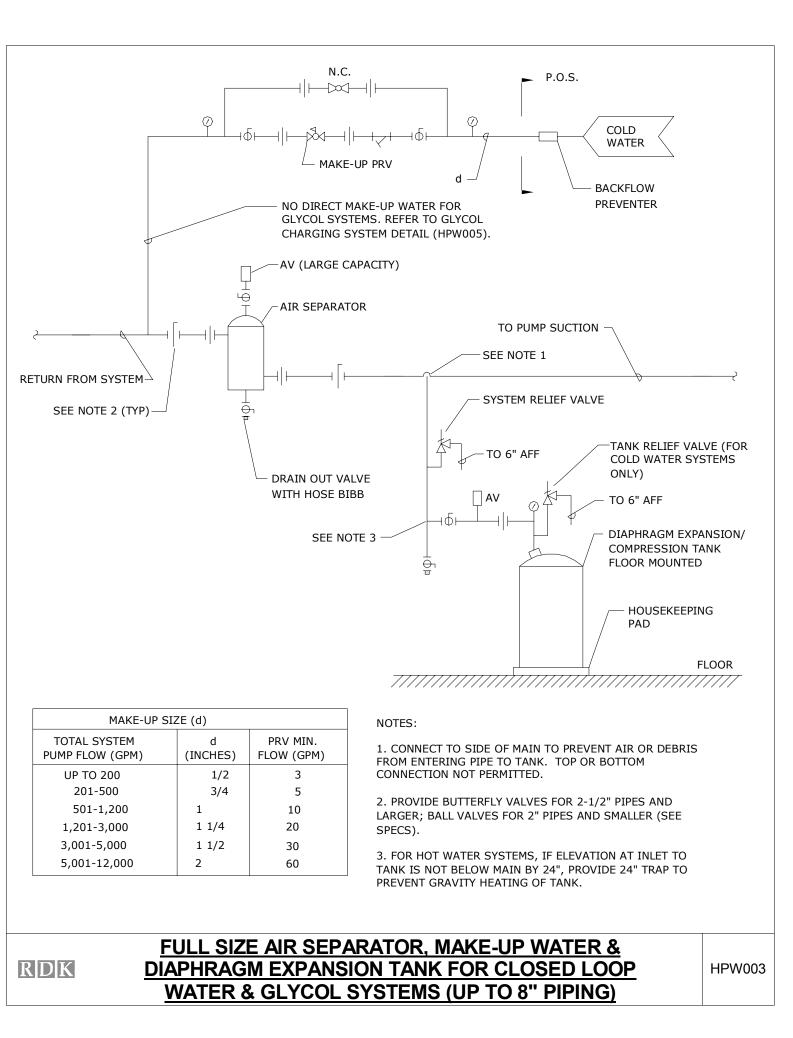


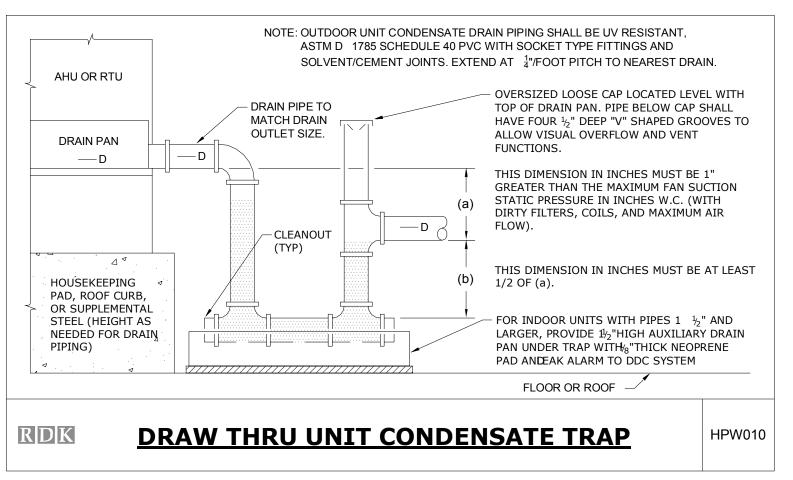


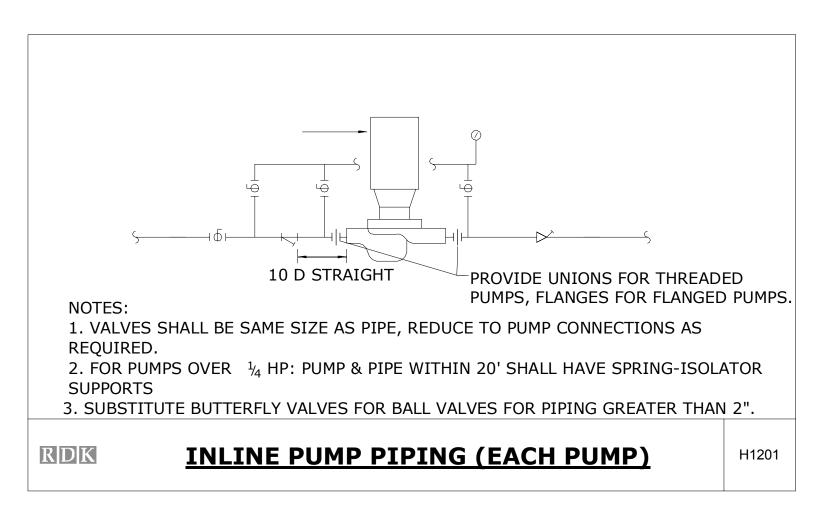


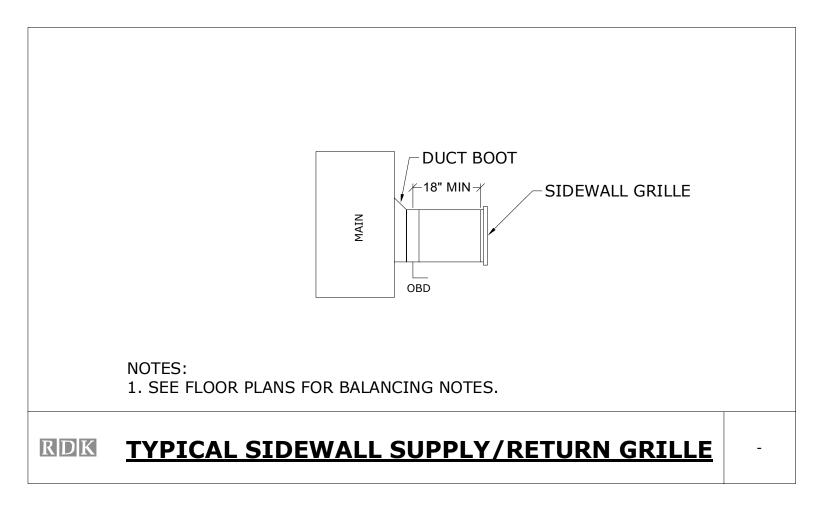


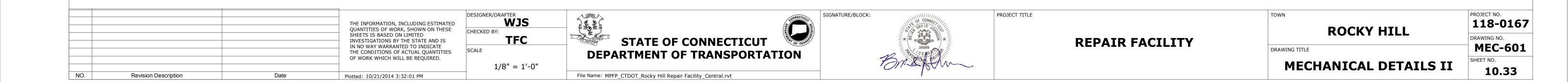


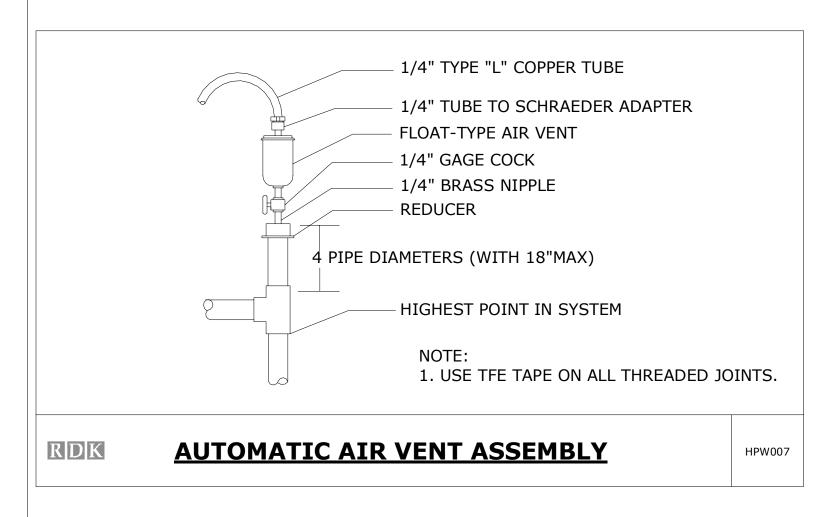


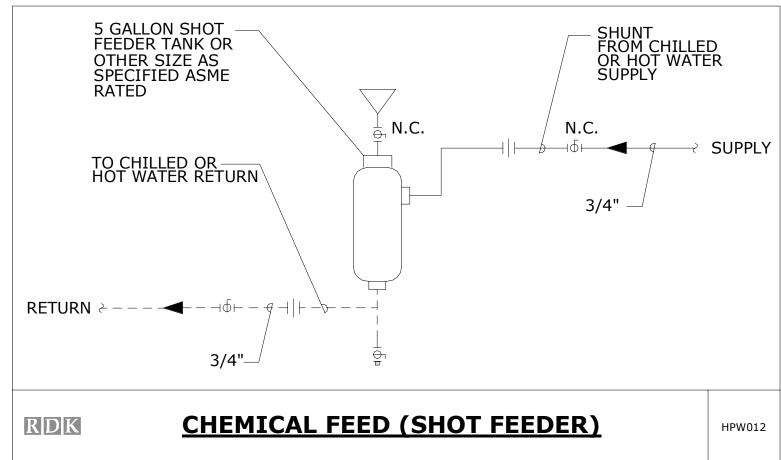


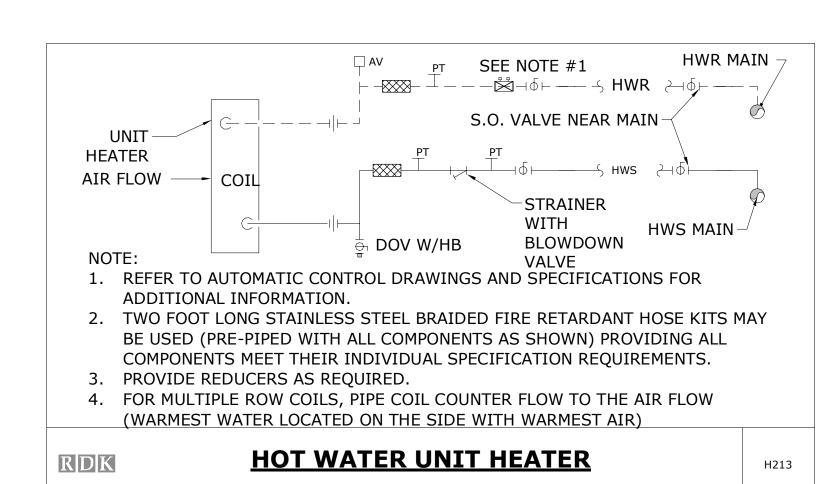


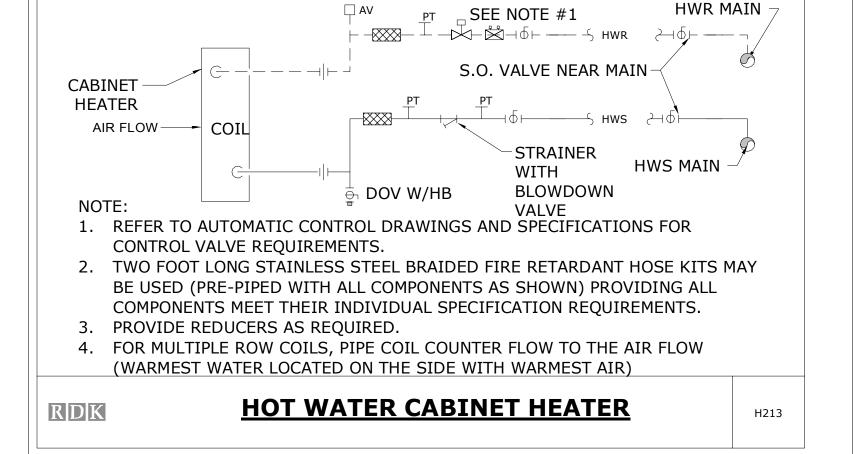


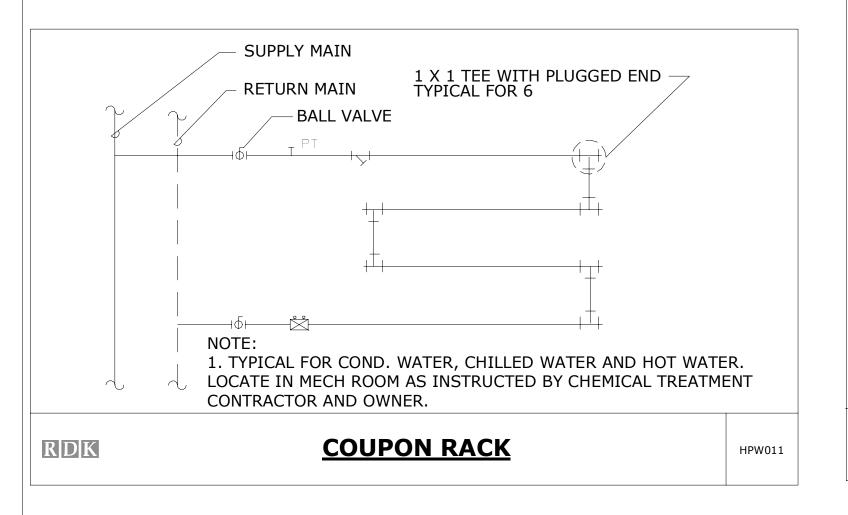


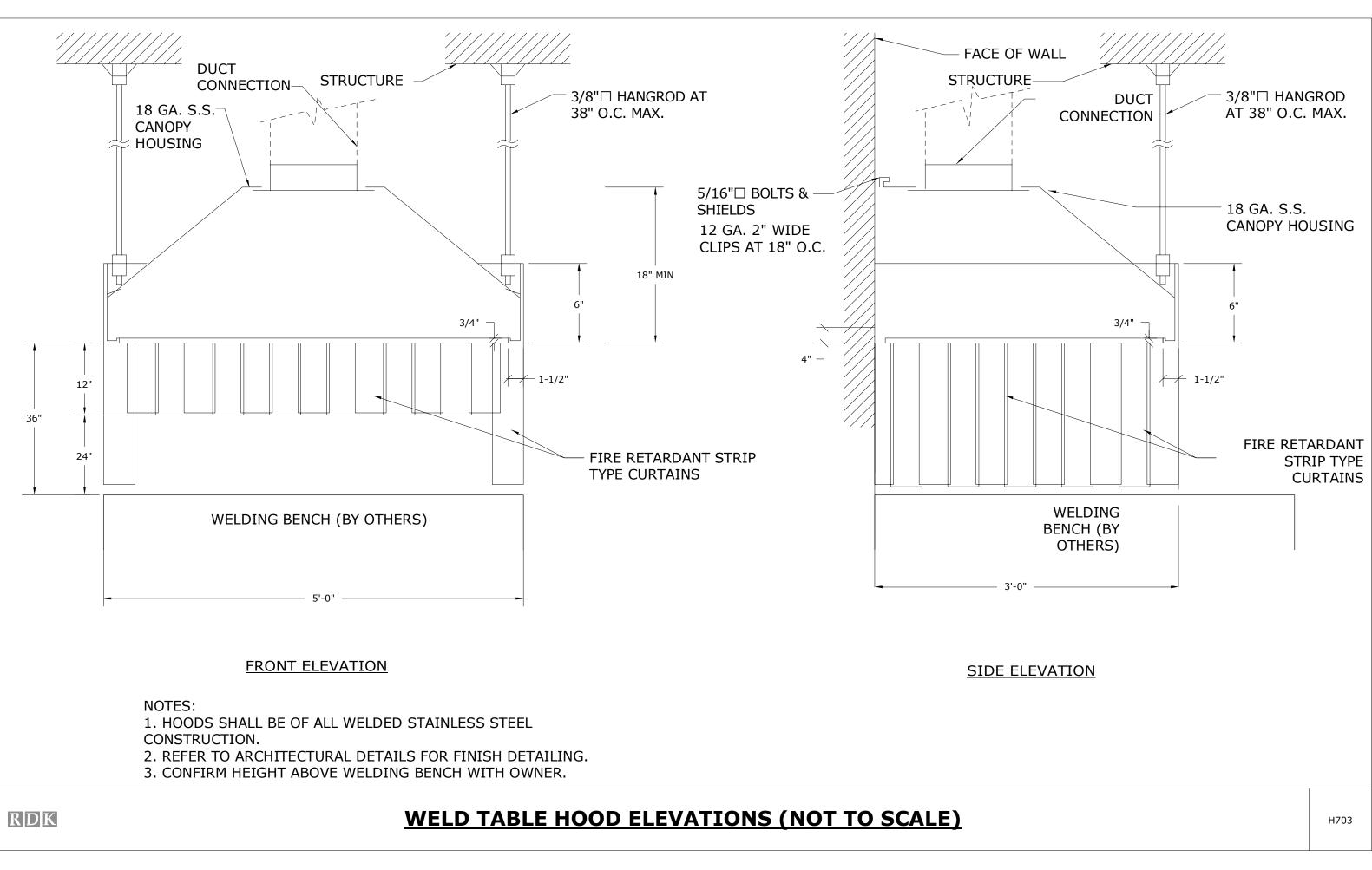


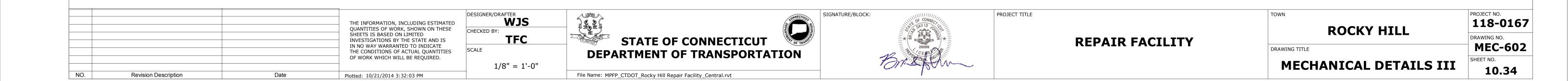


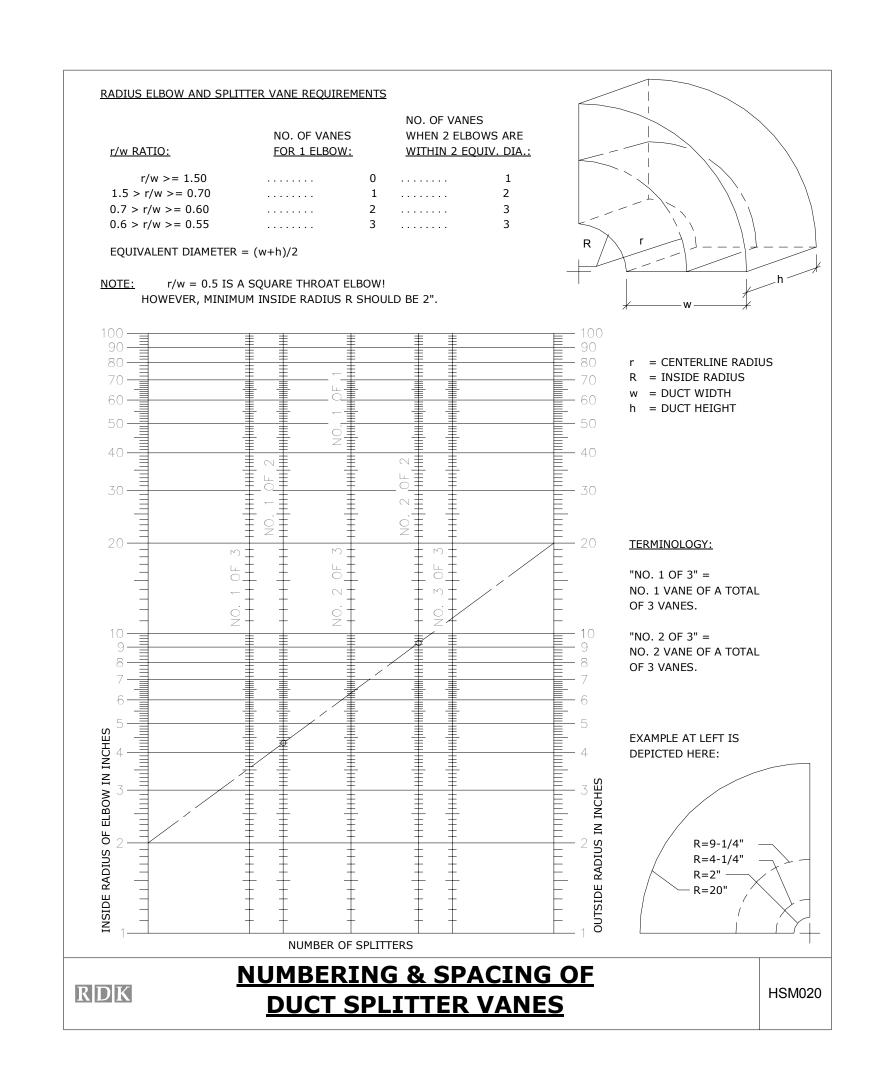


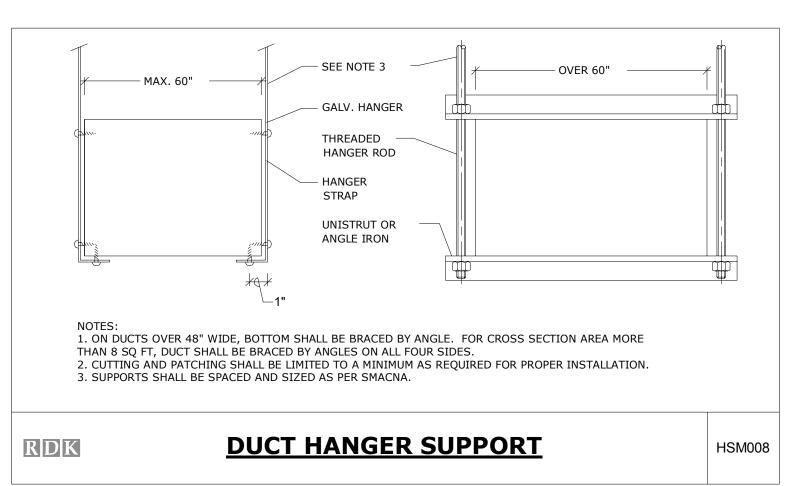


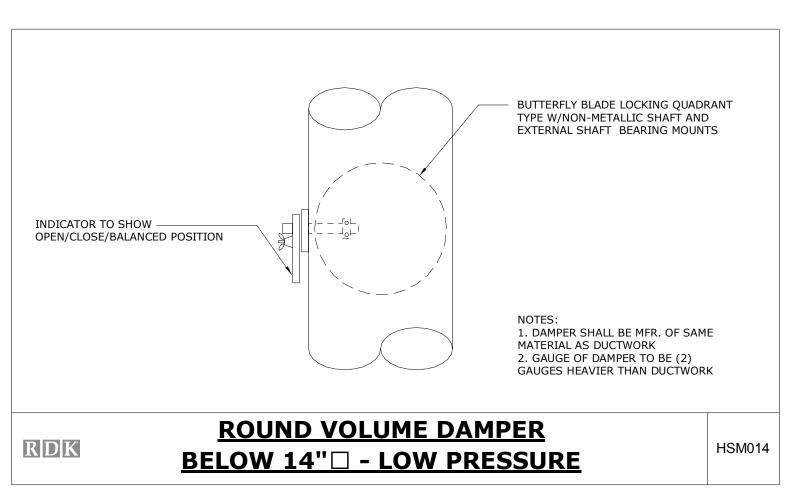


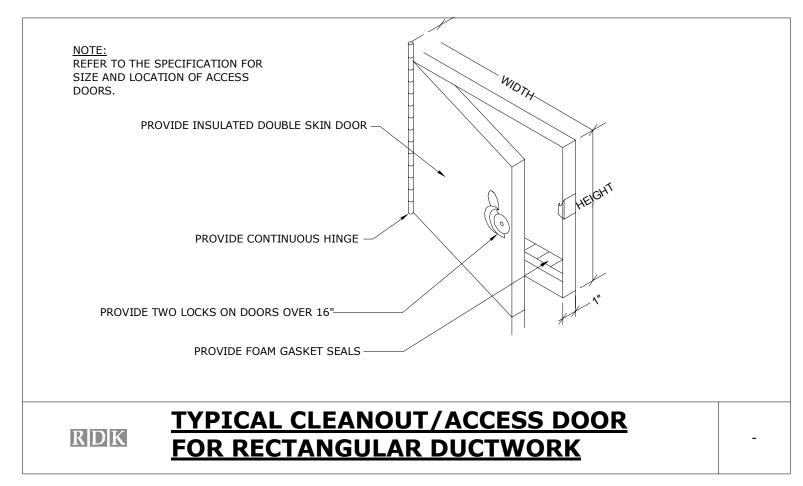


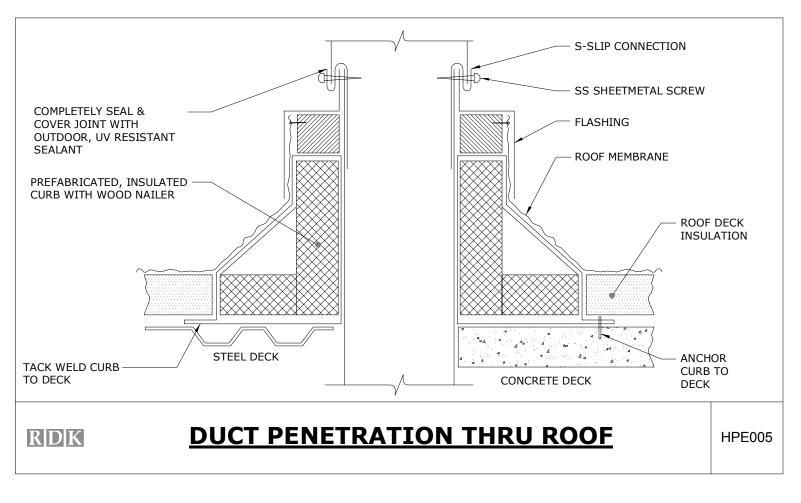


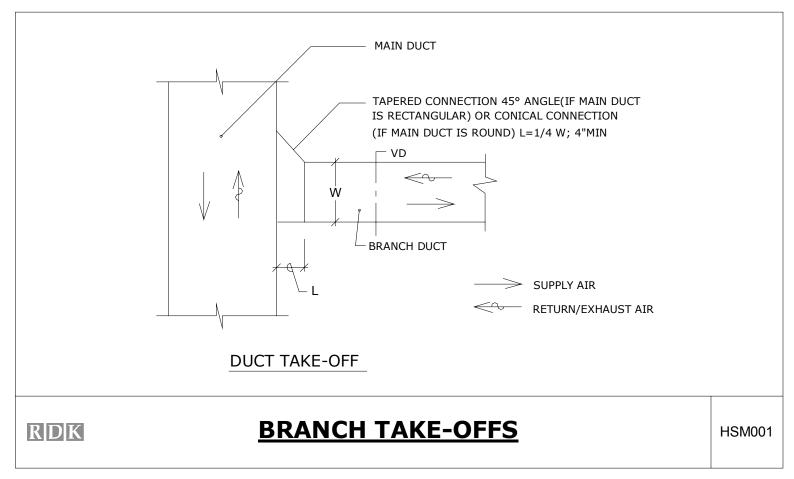


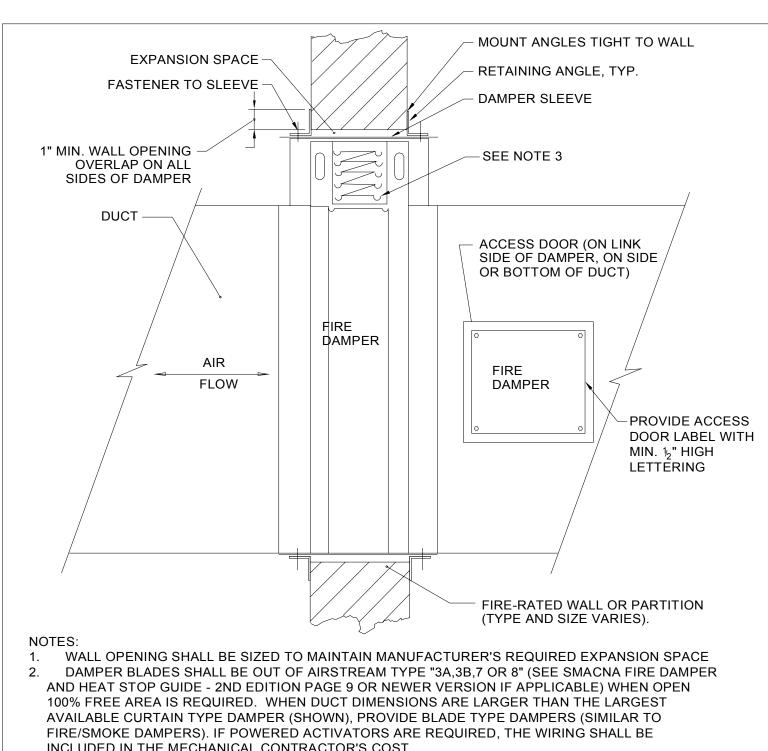












AROUND DAMPER.

INCLUDED IN THE MECHANICAL CONTRACTOR'S COST.

PROVIDE SPRING LOADED CLOSURE FOR ALL FIRE DAMPERS WHEN DUCTWORK IS INSULATED OR LINED, PROVIDE INSULATED ACCESS DOOR.

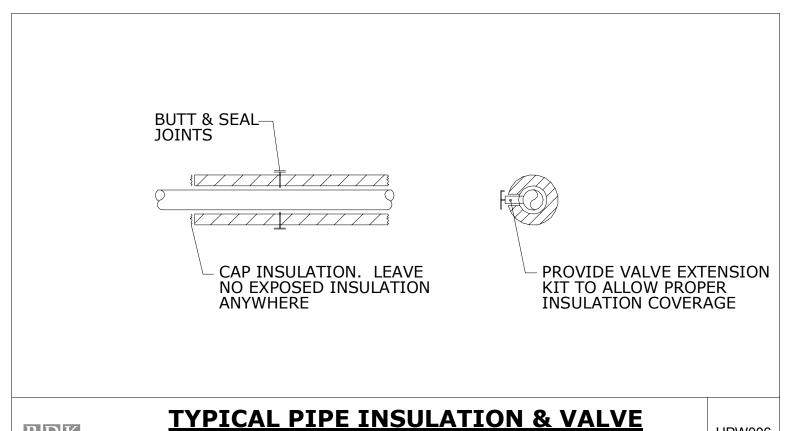
5. ACCESS DOOR SHALL BE 12" X 12" OR LARGER IF REQUIRED FOR FUSIBLE LINK REPLACEMENT WITH PERMANENTLY MOUNTED LABEL. 6. TYPE "1" OR "2" FIRE DAMPERS (BLADES OR FRAME IN AIR STREAM) MAY BE SUBSTITUTED FOR

TYPE "3A OR 3B" WHERE VELOCITIES ARE UNDER 500 FPM IN LOW PRESSURE DUCT SYSTEMS ONLY. 7. INSTALLATION SHOWN AS AN EXAMPLE. SPECIFIC INSTALLATION REQUIREMENTS, INCLUDING BREAKAWAY CONNECTIONS, SHALL CONFORM WITH MANUFACTURER'S UL APPROVED INSTRUCTIONS.

FIRE DAMPER R|D|K

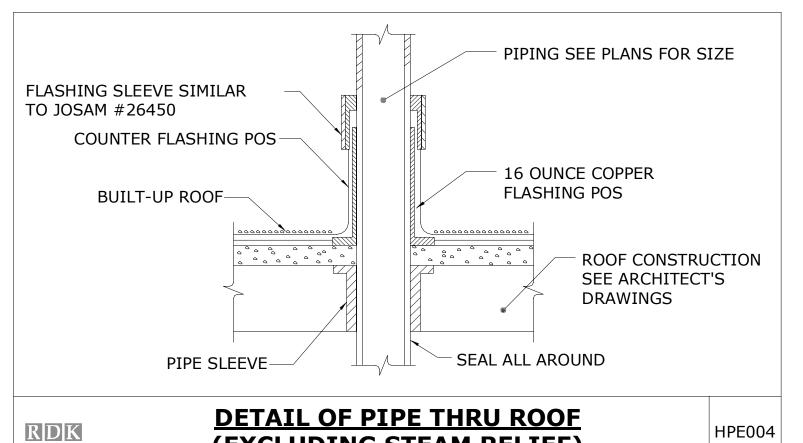
H1510

PROJECT TITLE DESIGNER/DRAFTER WJS 118-0167 THE INFORMATION, INCLUDING ESTIMATED **ROCKY HILL** QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED DRAWING NO. **STATE OF CONNECTICUT** TFC **REPAIR FACILITY** INVESTIGATIONS BY THE STATE AND IS **MEC-603** IN NO WAY WARRANTED TO INDICATE DRAWING TITLE THE CONDITIONS OF ACTUAL QUANTITIES **DEPARTMENT OF TRANSPORTATION** OF WORK WHICH WILL BE REQUIRED. **MECHANICAL DETAILS IV** 1/8" = 1'-0"10.35 Revision Description Plotted: 10/21/2014 3:32:04 PM File Name: MPFP_CTDOT_Rocky Hill Repair Facility_Central.rvt

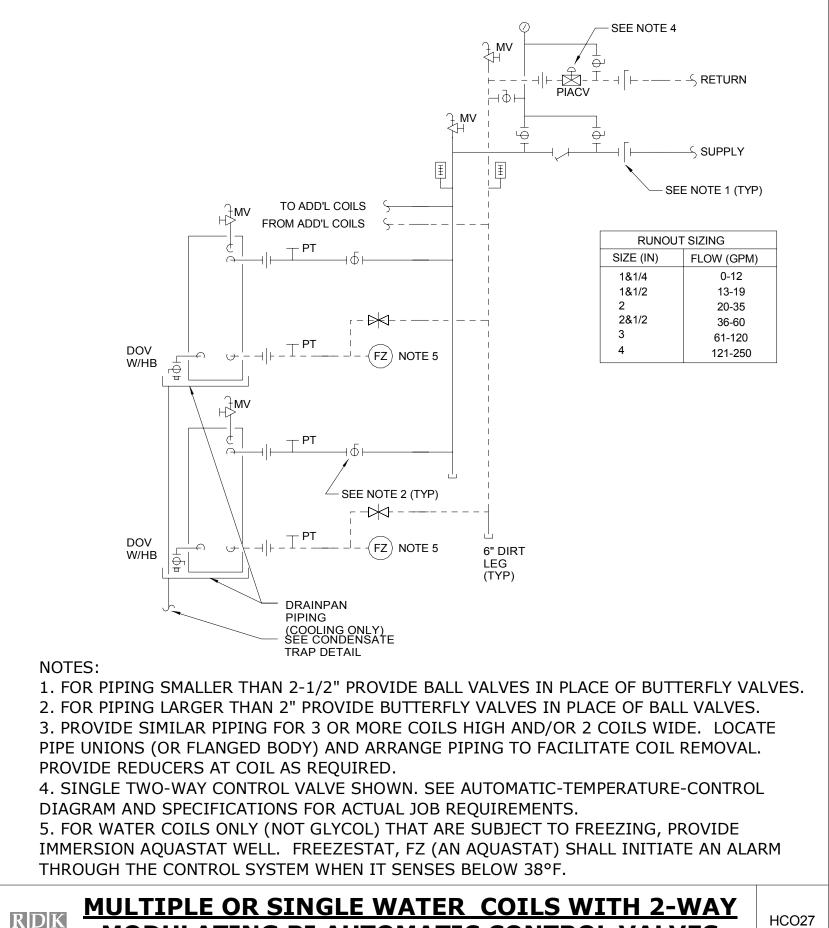


HANDLE EXTENSION

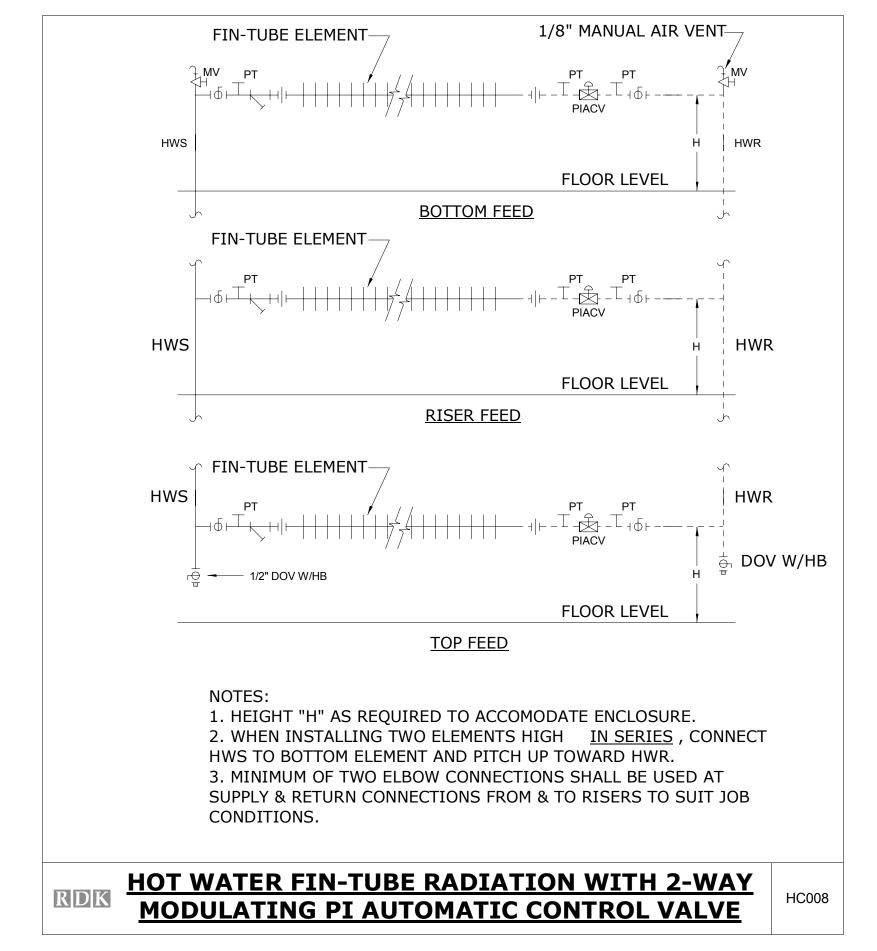
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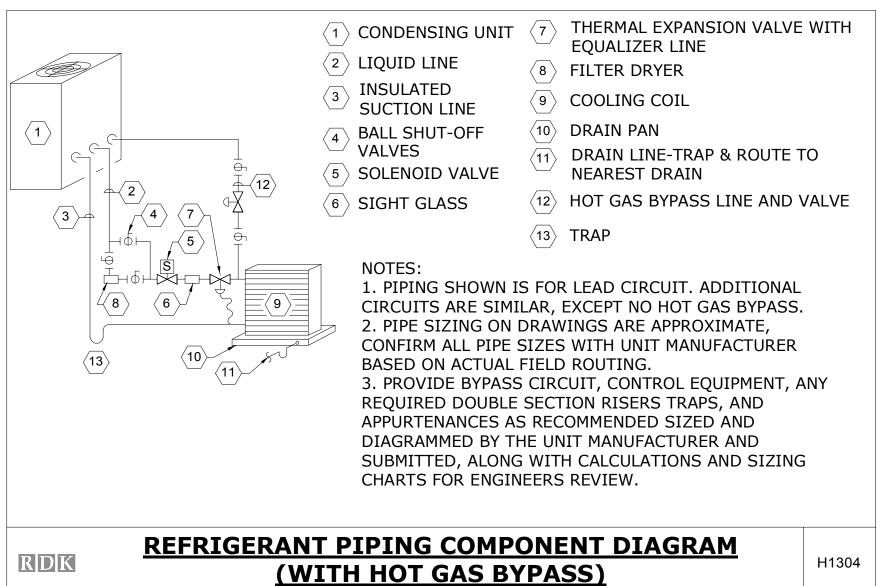


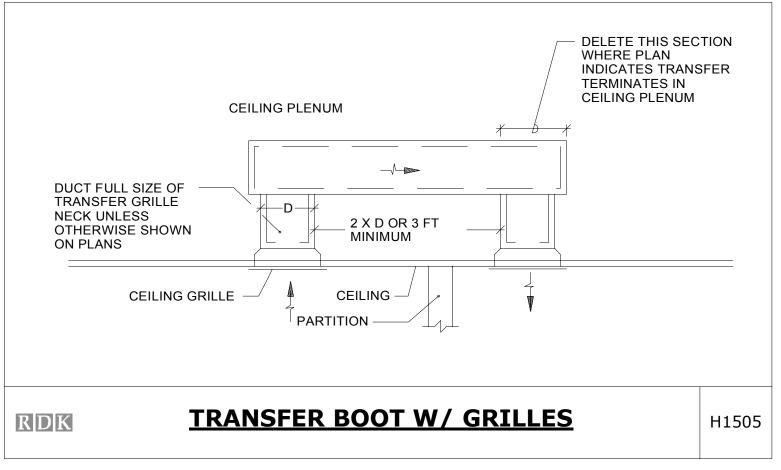
(EXCLUDING STEAM RELIEF)



R|D|K









THE INFORMATION, INCLUDING ESTIMATED

QUANTITIES OF WORK, SHOWN ON THESE

THE CONDITIONS OF ACTUAL QUANTITIES

INVESTIGATIONS BY THE STATE AND IS

IN NO WAY WARRANTED TO INDICATE

OF WORK WHICH WILL BE REQUIRED.

Plotted: 10/21/2014 3:32:06 PM

Date

Revision Description

DESIGNER/DRAFTER

WJS

TFC

1/8" = 1'-0"



ROCKY HILL

118-0167 DRAWING NO. **MEC-604**

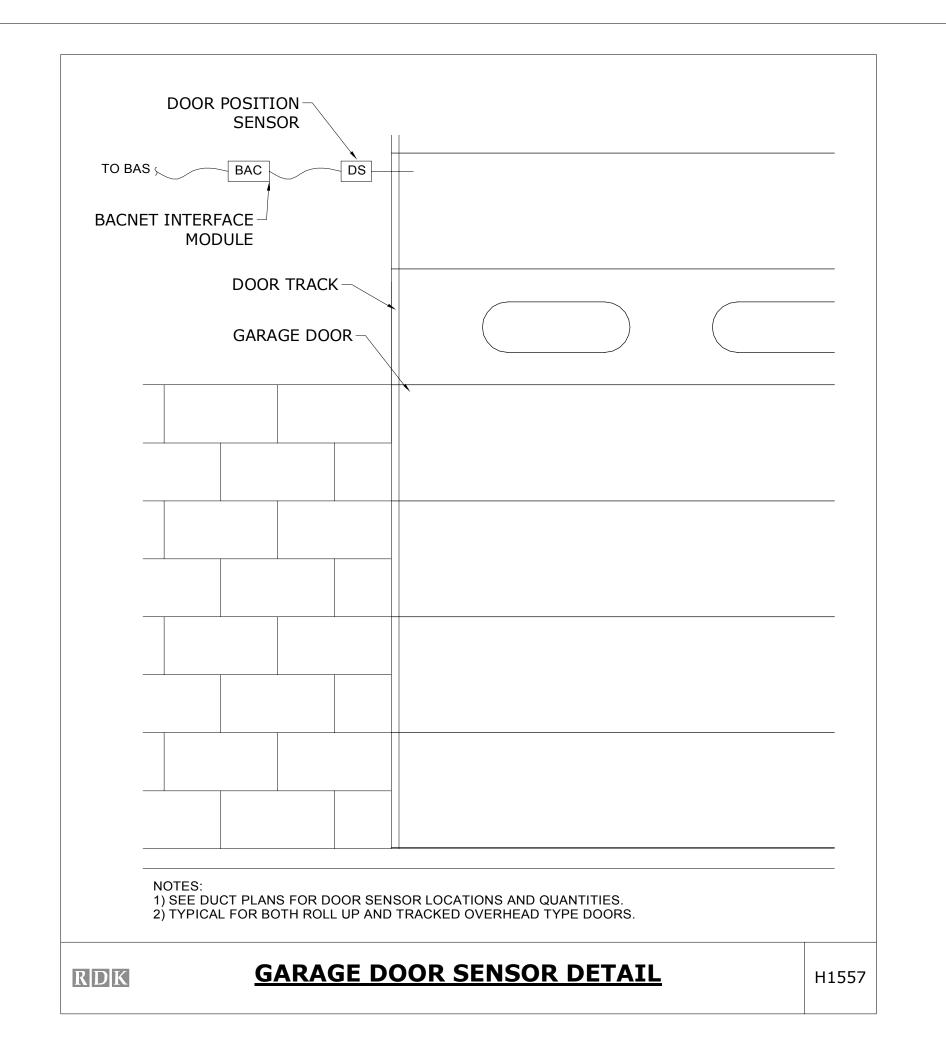
STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION

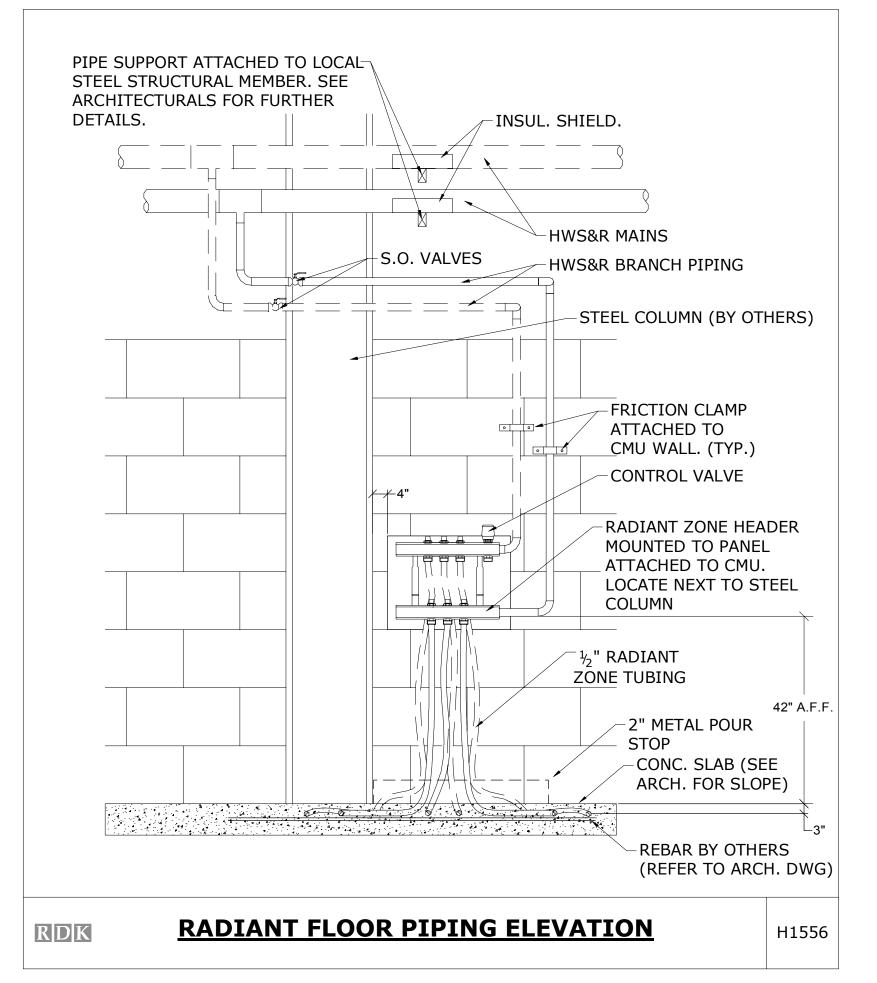
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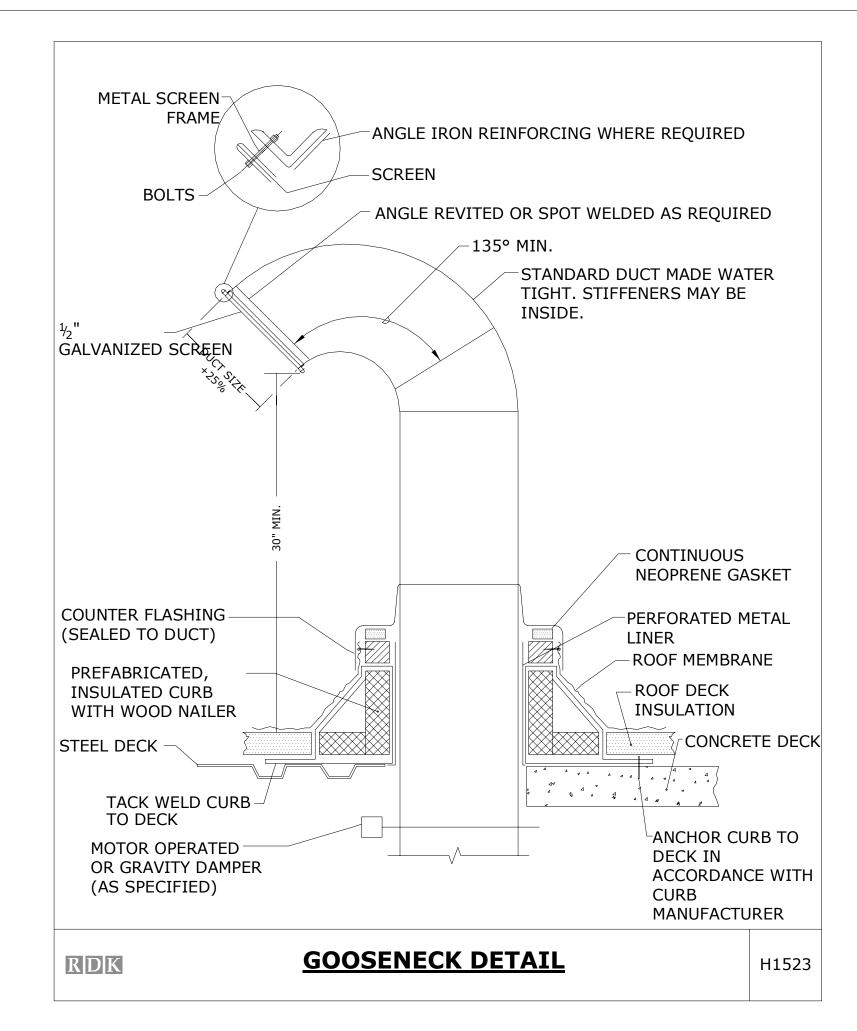
REPAIR FACILITY

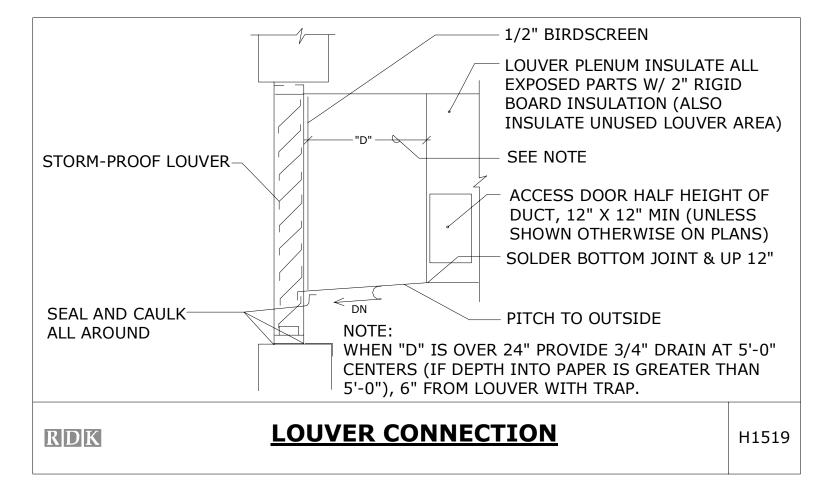
DRAWING TITLE **MECHANICAL DETAILS V**

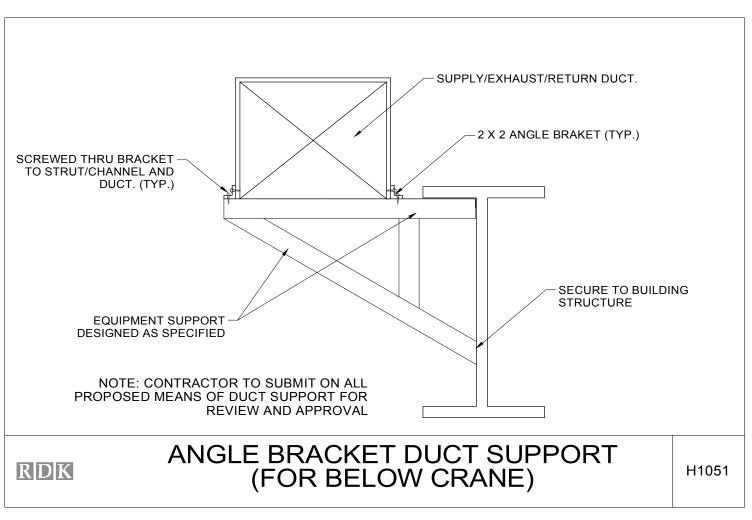
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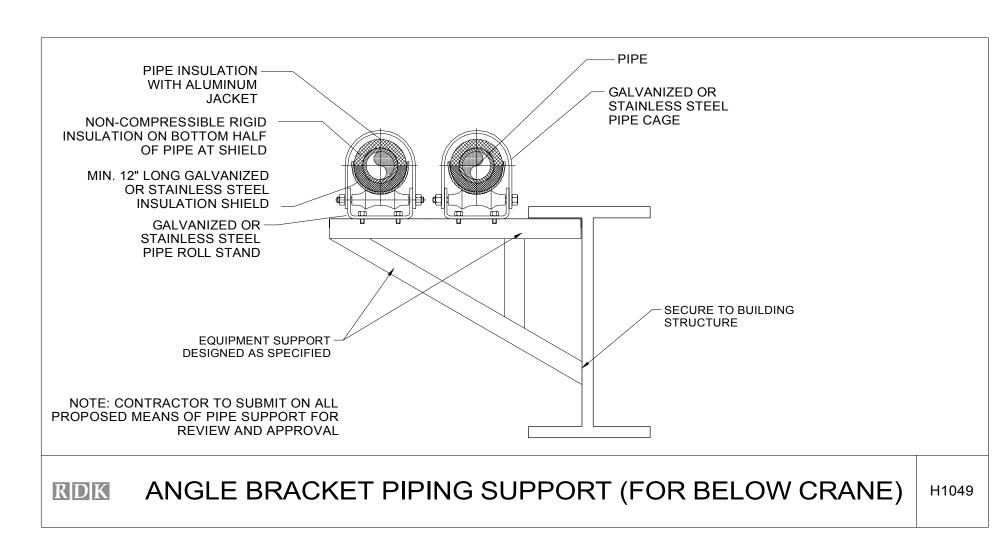












			THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE	DESIGNER/DRAFTER WJS CHECKED BY:	SOUNECTICO)	SIGNATURE/BLOCK: OF COMMSC	PROJECT TITLE	ROCKY HILL	PROJECT NO. 118-0167
			SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES	TFC SCALE	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	28569 CF MG	REPAIR FACILITY	DRAWING TITLE	MEC-605
NO.	Revision Description	Date	OF WORK WHICH WILL BE REQUIRED. Plotted: 10/21/2014 3:32:08 PM	1/8" = 1'-0"	File Name: MPFP CTDOT Rocky Hill Repair Facility Central.ryt	Ton 20 home		MECHANICAL DETAILS VI	SHEET NO. 10.37

							XHAUST FAI	N SCHEL							
				FAN	E.S.P.		WHEEL	OUTLET		M	OTOR		WEIGHT	MANUFACTURER AND MODEL NUMBER	
TAG	SERVICE	LOCATION	CFM	TYPE	(IN.WG)	DIA. (IN.)	TYPE DRIVE	VELOCITY (FPM)	RPM	ВНР	HP	V	(LBS)	(AS STANDARD)	REMARK
EF-1A,B,C,D	ERU-1,2,3,4	ROOF	11,250	HIGH PLUME	5	-	BELT	4000	1725	16.08	25	208	3 10,880	GREENHECK VEKTOR-MD-27-2-85	1,2,3,4,5
EF-2	WASH BAY	ROOF	6,000	CENT UPBLAST	.5	-	BELT	-	866	1.61	2	208	3 150	GREENHECK CUBE-220-20	1,2,3,4,5
EF-3	MECHANICAL RM	ROOF	3,000	CENT DNBLAST	.5	-	BELT	-	1725	.73	.75	208	3 80	GREENHECK CUBE-161-7	1,2,3,4,5
EF-4	PAINT EQUIP RM	ROOF	3,500	INLINE	1	-	DIRECT	-	1725	1.84	2	208	3 164	GREENHECK SQ-160-A	1,2,3,4,5
EF-5	SPRINKLER ROOM	ROOF	3,000	CENT DNBLAST	.5	-	BELT	-	1725	.73	.75	208	3 80	GREENHECK CUBE-161-7	1,2,3,4,5
VF-1	REPAIR BAY	ROOF	17,000	CENT UPBLAST	.75	-	BELT	-	1725	4.3	5	208	3 363	GREENHECK CUBE-420-50	1,2,3,4,5
VF-2	REPAIR BAY	ROOF	17,000	CENT UPBLAST	.75	-	BELT	-	1725	4.3	5	208	3 363	GREENHECK CUBE-420-50	1,2,3,4,5
VF-3	WELD SHOP	ROOF	3,500	CENT UPBLAST	.5	-	BELT	-	1725	0.7	.75	208	3 103	GREENHECK CUBE-180-7	1,2,3,4,5
VF-4	AERIAL BUCKET	ROOF	4,000	CENT UPBLAST	.5	-	BELT	-	1725	0.9	1	208	3 117	GREENHECK CUBE-200-10	1,2,3,4,5
VF-5	STORES STOCKROOM	ROOF	8,000	CENT UPBLAST	.5	-	BELT	-	1725	1.2	1.5	208	3 194	GREENHECK CUBE-300-15	1,2,3,4,5
VF-6	STORES STOCKROOM	ROOF	8,000	CENT UPBLAST	.5	-	BELT	-	1725	1.2	1.5	208	3 194	GREENHECK CUBE-300-15	1,2,3,4,5
VF-7	LUBE/COMPRESSOR	ROOF	2,000	CENT UPBLAST	.5	-	BELT	-	1725	0.46	.5	208	3 77	GREENHECK CUBE-141-5	1,2,3,4,5
VF-8	LUBE BAYS	ROOF	4,500	CENT UPBLAST	.5	-	BELT	-	1725	1.15	1.5	208	3 122	GREENHECK CUBE-200-15	1,2,3,4,5
VF-9	WELD/FABRICATION SHOP	ROOF	7,500	CENT UPBLAST	.5	-	BELT	-	1725	0.7	2	208	3 184	GREENHECK CUBE 240-20	1,2,3,4,5
VF-10	MACHINE SHOP	ROOF	7,500	CENT UPBLAST	.5	-	BELT	-	1725	0.7	2	208	3 184	GREENHECK CUBE 240-20	1,2,3,4,5
VF-11	MACHINE SHOP	ROOF	7,500	CENT UPBLAST	.5	-	BELT	-	1725	0.7	2	208	3 184	GREENHECK CUBE 240-20	1,2,3,4,5
VF-12	CNG INSPECTION	ROOF	6,000	CENT UPBLAST	.5	-	BELT	-	1725	1.3	1.5	208	3 143	GREENHECK CUBE 240-15	1,2,3,4,5
VF-13	PARTS WASHER	ROOF	900	CENT UPBLAST	.5	-	BELT	-	1725	0.18	0.25	208	3 56	GREENHECK CUBE 101-4	1,2,3,4,5
VF-14	PAINT EQUIP. RM	ROOF	600	CENT UPBLAST	.5	-	BELT	-	1725	0.18	0.25	208	3 56	GREENHECK CUBE-101HP-4	1,2,3,4,5
VF-15	PAINT BOOTH HALL	ROOF	2,000	CENT UPBLAST	.5	-	BELT	-	1725	0.46	.5	208	3 77	GREENHECK CUBE-141-5	1,2,3,4,5
TE-1	MENS RM, WOMENS RM, JANITOR CLOSET	ROOF	2,000	CENT DNBLAST	1	-	BELT	-	1725	.59	.75	208	3 62	GREENHECK G-133-A	1,2,3,4,5
ES-1 THRU 10	VARIES	IN-ROOM	1,400	UTILITY SET	5	-	BELT	-	3600	3.0	2.12	208	3 159	GREENHECK BISW	1,2,3,4,5
EHF-1 THRU 4	VARIES	IN-ROOM	600	UTILITY SET	4	-	BELT	-	3600	_	1.5	208	3 158	GREENHECK BISW	1,2,3,4,5

1 PROVIDE WITH FACTORY ROOF CURB

2 PROVIDE WITH BACKDRAFT DAMPER 3 PROVIDE NEMA-3R RATED DISCONNECT SWITCH. 4 PROVIDE WITH BMS START/STOP AND SCHEDULING.

5 PROVIDE WITH VFD

					DU	CTLESS SPL	IT AIR-CONDITIONING	S UNIT S	SCHEDULI	E								
			INDOOR UNIT			REFRIGERANT				0	UTDOOR COI	NDENSING U	NIT					
TAG	LOCATION			CAPACIT	Y(MBH)					0011115	DEGLON		ELEC	CTRIC (OUTD	OOR)		REMARKS
IAG	LOCATION	CFM	MANUFACTURER AND MODEL NUMBER (INDOOR UNIT)	BTU'S/HR	COND. (GPM)	TYPE	MANUFACTURER AND MODEL NUMBER (OUTDOOR UNIT)	TAG	LOCATION	SOUND PRESSURE DB(A)	DESIGN AMBIENT TEMP (°F)	MINIMUM AMBIENT TEMP (°F)	MCA	HZ	V	PH	EFFICIENCY (SEER)	KLIWAKKO
AC-1	ELEC. RM.	1,025	MITSUBISHI PCA	24,000	0.02	R410A	PUY-A24NHA4	ACCU-1	ROOF	48	95°	0°	18	60	208	1	16.8	1 THRU 8
AC-2	COMM RM	670	MITSUBISHI PCA	42,000	0.03	R410A	PUYA42NHA4	ACCU-2	ROOF	51	95°	0°	26	60	208	1	15.8	1 THRU 8

1 REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.

2 SEE DRAWINGS FOR UNIT QUALITIES. 3 PROVIDE 1-1/4" CONDENSATE DRAIN TO LOCAL FLOOR DRAIN.

4 PROVIDE REFRIGERANT PIPING BETWEEN INDOOR AND OUTDOOR UNITS SIZED AS PER MANUFACTURERS RECOMMENDATIONS FOR LENGTH OF RUN.
5 PROVIDE FIELD SUPPLIED INTERCONNECTED POWER WIRING FROM OUTDOOR UNIT TO INDOOR UNIT.
6 PROVIDE WITH ROOM MOUNTED T-STAT.

7 PROVIDE WITH DISCONNECT SWITCH. 8 PROVIDE WITH FACTORY WIND BAFFLE ACCESSORY INSTALLED.

					(CABI	NET U	NIT F	HEATE	R (C	JH) S	CHEDU	LE (H	OT W	ATER	?)		
					AIR				MOTOR				٧	VATER				
TAG	LOCATION	TYPE	OUTPUT MBH	CFM	EAT	LAT	RPM	LID	ELECT	RIC SE	RVICE	FLLIID	GPM	EWT	LWT	P.D.	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
				CFIVI	(°F)	(°F)	RPIVI	HP	AMPS	V	PH	FLUID	GPIVI	(°F)	(°F)	(FT.)	,	
CUH-1	VESTIBULE	FLOOR	29.8	609	45	90	1050	<u>1</u> 30	.27	208	3	H20	2.55	140	110	0.3	TRANE FORCE-FLO	1 THRU 5
CUH-2	VESTIBULE	FLOOR	29.8	609	45	90	1050	<u>1</u> 30	.27	208	3	H20	2.55	140	110	0.3	TRANE FORCE-FLO	1 THRU 5
NOTEO		•	•	•	•	•					•	•	•	•	•	•		

1 REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.
2 PROVIDE MINIMUM OF 20 GAUGE STEEL CASING PAINTED WITH A CORROSION RESISTANT, BAKED, POLYESTER POWDER COATED FINISH.

3 PROVIDE FULLY ADJUSTABLE AIR DEFLECTORS AND OSHA APPROVED FAN GUARD.

4 PROVIDE ALUMINUM FINS AND COPPER TUBE COILS.

5 PROVIDE FACTORY WALL MOUNTED THERMOSTAT.

			\A/E!	D E \ (1.14.1.14	OT 4 D14		A) 0011ED111 E	
			WELI	DEXHAUS	SLARM	I (WE	A) SCHEDULE	
			AIR	DIMENS	IONAL DAT	ГА		
TAG	LOCATION	CFM	P.D. (IN W.G.)	DIAMETER	REACH		MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
WEA	VARIES	600	0	6"□	14'-0"	-	NEDERMAN NEX MD 4	1,2
NOTEO.		•				-		

1 REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION. 2 PURCHASE WITH MOUNTING BRACKET.

TAG

WB-1

WB-2

WB-3

NOTES:

LOCATION

MECH RM

MECH RM

MECH RM

																ENE	RGY R	ECOV	ERY U	NIT SC	HEDL	JLE													
									FAN DAT	A									HEATIN	IG COIL (HOT W	ATER)					Ē	ENERGY	'RECOV	ERY PL	ATE				
	AG I	LOCATION	OA CFM TOTAL		ACITY TROL	STATIC PR			V	VHEEL		N	MOTOR						AIR DAT	Α	НО	T WAT	ER DA						WINTE	:R			WT (LBS)	MF'R AND MODEL NO. (AS STANDARD)	REMARKS
			TOTAL	RANGE (%)	TYPE	EXTERNAL	TOTAL W/ DIRTY	OUTLET VEL. (FPM)	DIA. (IN.)	TYPE	RPM	ВНР	HP	٧	PH	CAPACITY (MBH)	FACE VEL. (FPM)	EAT (°F)	LAT (°F)	P.D. (IN.WC)	GPM	EWT (°F)	LWT (°F)	P.D. (FT.)	NO. OF COILS/ ROWS	FIN/ FT.	CAPACITY (MBH)	MAX P.D. (IN.)	SUP	PLY	EXHA	AUST			
							FILTERS																					(,	EAT	LAT	EAT	LAT			
El	RU-1	ROOF	17,500	100	VFD	1.5	2.5	2512	25	PLENUM	1447	15.99	20	208	3	704	499	42	80	0.15	47	140	110	2.75	2	87	804	0.87	0	42	70	29	8871	TRANE CLIMATE CHANGER CSAA035UA	1 THRU 8
El	RU-2	ROOF	17,500	100	VFD	1.5	2.5	2512	25	PLENUM	1447	15.99	20	208	3	704	499	42	80	0.15	47	140	110	2.75	2	87	804	0.87	0	42	70	29	8871	TRANE CLIMATE CHANGER CSAA035UA	1 THRU 8
EI	RU-3	ROOF	4,200	100	VFD	1.5	2.5	2032	15	PLENUM	1798	2.7	3	208	3	168	418	42	80	0.11	11.2	140	110	0.75	2	86	192	0.26	0	42	70	29	3324	TRANE CLIMATE CHANGER CSAA010UA	1 THRU 8
El	RU-4	ROOF	9,000	100	VFD	1.5	2.5	3121	18	PLENUM	2071	7.9	10	208	3	369	432	42	80	0.12	24.5	140	110	1.41	2	84	453	0.6	0	42	70	29	5248	TRANE CLIMATE CHANGER CSAA021UA	1 THRU 8

1 REFER TO SPECIFICATIONS, AND DETAILS FOR ADDITIONAL INFORMATION.
2 UNITS TO BE DOUBLE WALLED WITH INSUL. PROVIDE INSULATED DOUBLE WALL ACCESS DOORS (WITH MULT-IPOINT DOOR LATCH AND VISION PANELS) FOR EACH SECTION. OUTDOOR AIR DAMPERS SHALL BE INSULATED ULTRA LOW LEAKAGE DAMPERS WITH BLADE SEALS. SUPPLY AIR FAN ASSEMBLY TO BE

DESIGNER/DRAFTER

1/8" = 1'-0"

CHECKED BY:

SCALE

PROVIDED WITH INTERNAL VIBRATION ISOLATORS (WITH 2" INCH DEFLECTION SPRING ISOLATORS).

3 PROVIDE ALL UNITS WITH FACTORY VFD AND PREMIUM EFFICIENCY VFD COMPATIBLE MOTORS. 4 PROVIDE STAINLESS STEEL DRAIN PAN THAT EXTENDS 10" BEYOND FACE OF COIL.

5 PROVIDE DISCHARGE PLENUM SECTION.

Revision Description

6 PROVIDE FACTORY DISCONNECT SWITCH AND SINGLE POINT POWER. 7 M.C. TO VERIFY LOCATION OF COIL CONNECTION, ACCESS DOORS, FILTER PULL, MOTOR ACCESS, ETC. PRIOR TO ORDERING UNITS. REFER TO PLANS.
8 PROVIDE WITH FACTORY MOUNTED CONTROLS.

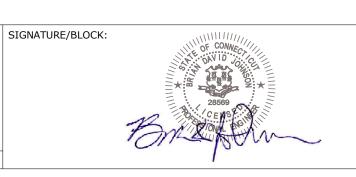
						PUN	MP SCHE	EDULE								
TAG	SERVICE	LOCATION	CASING	FL	UID	- GPM	NPSHR	HEAD	SHUT-OFF HEAD	IMPELLER SIZE		MO	TOR		MANUFACTURER AND MODEL NUMBER	REMARKS
17.0	GERVIGE	EGGATION	TYPE	TYPE	TEMP (°F)	OI W	(FT.)	(FT.)	(FT.)	(IN.)	RPM	HP	V	PH	(AS STANDARD)	NEW WAY
HWP-1	ENERGY RECOVERY UNITS	MECH RM	CAST IRON	H20	140	150	90	70	-	9.25	1760	5	208	3	TACO KS-2009	1,2
HWP-2	UH'S	MECH RM	CAST IRON	H20	140	450	130	90	-	11.25	1760	20	208	3	TACO KS-4011	1,2
HWP-3	RADIANT FLOORING	MECH RM	CAST IRON	H20	107	110	130	115	-	11.25	1760	10	208	3	TACO KS-2011	1,2
HWP-4	SPARE	MECH RM	CAST IRON	H20	140	450	130	115	-	11.25	1760	20	208	3	TACO KS-4011	1,2
HWP-5	FIN TUBE RADIATION & CUH'S	MECH RM	CAST IRON	H20	140	100	105	60	-	8.75	1760	5	208	3	TACO KS-1509	1,2
HWP-6	IN-DUCT HEATING COIL	MECH RM	CAST IRON	H20	140	35	45	30	-	5.75	1760	3 4	208	3	TACO KS-1506	1,2

NOTES: 1 REFER TO SPECIFICATIONS, AND DETAILS FOR ADDITIONAL INFORMATION. 2 PROVIDE WITH SUCTION DIFFUSER (ONLY IF REQUIRED STRAIGHT LENGTHS UNACHIEVABLE), TRIPLE DUTY VALVE, FLEX CONNECTORS, STRAINERS, GAUGES AND ISOLATION VALVES.

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	THE INFORMATION, INCLUDING ESTIMATED
	QUANTITIES OF WORK, SHOWN ON THESE
	SHEETS IS BASED ON LIMITED
	INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE
	THE CONDITIONS OF ACTUAL QUANTITIES
	OF WORK WHICH WILL BE REQUIRED.

STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTAT	CONNECTION OF TRANS
File Name: MPFP_CTDOT_Rocky Hill Repair Facility_Central.rvt	



1 REFER TO SPECIFICATIONS, AND DETAILS FOR ADDITIONAL INFORMATION. 2 PROVIDE CONDENSATE NEUTRALIZATION KIT WITH PIPED DRAIN FROM EACH FLUE.

3 PROVIDE SIDEWALL VENT AND COMBUSTION AIR TERMINATION KIT.

OUTPUT

(GROSS I=B=R)

2,190 65.4

BHP

2,190 65.4 2,200

2,190 65.4 2,200

PROJECT TITLE

NATURAL GAS

(IN.WG)

INPUT PRESSURE EFFICIENCY DESIGN

98

CAPACITY

2,200

REPAIR FACILITY

IOWN		
	ROCKY	HIL

118-0167 DRAWING NO. **MEC-700**

10.38

MECHANICAL SCHEDULES

DRAWING TITLE

MANUFACTURER AND

MODEL NUMBER (AS

STANDARD)

BUDERUS SB625WS-640

3,300 BUDERUS SB625WS-640

3,300 BUDERUS SB625WS-640

4 PROVIDE FACTORY LOW WATER CUT-OFF, HIGH TEMPERATURE LIMIT, FLOW SWITCH, RELIEF VALVE, TEMPERATURE PRESSURE GAUGE.
5 PROVIDE MANUFACTURER CONTROL PACKAGE.

AIR SEPARATOR SCHEDULE

PIPE SIZE

(IN)

6"

WEIGHT

(LBS)

MANUFACTURER AND MODEL NUMBER

(AS STANDARD)

HYSPAN 1500 SERIES

HYSPAN 1500 SERIES

HYSPAN 1500 SERIES

HYSPAN 1500 SERIES

WEIGHT

3,300

TURN (LBS)

15:1

236 TACO ACT06F-125

MANUFACTURER AND MODEL NUMBER

(AS STANDARD)

REMARKS

REMARKS

1 THRU 5

1 THRU 5

1 THRU 5

REMARKS

1 THRU 4

WATER

FLOW

(GPM)

610

PIPE SIZE

2-1/2"

BURNER

NATURAL GAS

NATURAL GAS

NATURAL GAS 15:1

PIPE EXPANSION JOINT SCHEDULE

TANGENTIAL

BELLOWS

BELLOWS

BELLOWS

BELLOWS

BREECHING

GPM °F SCFM

LOCATION

REFER TO SPECIFICATIONS, AND DETAILS FOR ADDITIONAL INFORMATION.
 PROVIDE HIGH CAPACITY AIR VENT.

LOCATION

VARIOUS

VARIOUS

VARIOUS

VARIOUS

1 REFER TO SPECIFICATIONS, AND DETAILS FOR ADDITIONAL INFORMATION.

WATER

LVG

(°F)

CONDENSING BOILER SCHEDULE (HOT WATER)

ENT

(°F)

110 | 140

110 | 140

110 140

SERVICE

AS-1 HEATING WATER MECH RM

3 PROVIDE FACTORY FLANGED INLET/OUTLET.

SERVICE

EJ-1 HEATING WATER

EJ-2 | HEATING WATER

EJ-3 HEATING WATER

EJ-4 HEATING WATER

PRESS. (PSIG)

MAX

RELIEF

VALVE

4 PROVIDE UNIT LESS STRAINER.

TAG

NOTES:

PACKAGED DX ROOFTOP AIR HANDING UNIT SCHEDULE CFM DX COOLING COIL STATIC PRESS. (IN. WG) CAPACITY (MBH) AIR DATA MANUFACTURER AND **FACE REFRIG-**REMARKS SERVICE LOCATION MODEL NUMBER TOTAL VELOCITY ERANT ROWS PER (AS STANDARD) O.A. EAT (°F) LAT (°F) TYPE P.D. TOTAL W/ DIRTY BHP/ 1000 (FPM) RPM SENS. FXTFRNAI **FILTERS** WB OFFICES ROOF 7,200 750 1 THRU 6 RTU-1 1.75 2.5 884 6.22 7.5 | 208 | 3 | 125 | 112 | 251 182 230 R-410A 80 67 59.6 56.7 0.3 4 180 TRANE THD240 SERIES

2 REFER TO ELECTOR SHADIS ATOM TADDIVILLONIA DRINFORMATION

3 PROVIDE VIBRATION ISOLATION CURB WITH SUPPLY AND RETURN SOUND ATTENUATORS. 4 PROVIDE SOFTWARE INTERFACE TO CONNECT TO BMS.

5 PROVIDE WITH FACTORY MOUNTED CONTROLS

6 PROVIDE WITH OUTDOOR AIR FLOW MEASURING STATION FOR O.A. CONTROLS MODULATION.

				DIFF	JSER AND	GRILLE SCHEDU	LE		
TAG	SELECTION RANGE (CFM)	NECK SIZE (IN.)	OVERALL SIZE (IN.)	SERVICE	MOUNTING	TYPE	NOTES	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
SA	0-150	8"□	22x22	SUPPLY	CEIILNG	LAY-IN OR SURFACE	-	TITUS TMS	1 THRU 8
SB	0-285	12"□	22x22	SUPPLY	CEILING	LAY-IN OR SURFACE	-	TITUS TMS	1 THRU 7
SC	0-250	15"□	22x22	SUPPLY	CEILING	LAY-IN OR SURFACE	-	TITUS TMS	1 THRU 8
SD	0-360	14"□	22x22	SUPPLY	CEILING	LAY-IN OR SURFACE	-	TITUS TMS	1 THRU 7
SE	0-500	15"□	22x22	SUPPLY	CEILING	LAY-IN OR SURFACE	-	TITUS TMS	1 THRU 7
SF	0-500	12"□	22x22	SUPPLY	CEILING	LAY-IN OR SURFACE	-	TITUS TMS	1 THRU 7
SG	0-1700	24"x22"	$25\frac{3}{4}$ "x $23\frac{3}{4}$ "	SUPPLY	DUCT	SIDEWALL GRILLE	DOUBLE DEFLECTION	TITUS 300FL	1,4,7
SH	0-800	18"x18"	19 ³ / ₄ "x19 ³ / ₄ "	SUPPLY	DUCT	SIDEWALL GRILLE	DOUBLE DEFLECTION	TITUS 300FL	1,4,7
SI	0-700	18"X14"	$19\frac{3}{4}$ "x $15\frac{3}{4}$ "	SUPPLY	DUCT	SIDEWALL GRILLE	DOUBLE DEFLECTION	TITUS 300FL	1,4,7
SJ	0-500	14"x14"	$15\frac{3}{4}$ "x $15\frac{3}{4}$ "	SUPPLY	DUCT	SIDEWALL GRILLE	DOUBLE DEFLECTION	TITUS 300FL	1,4,7
SK	0-3350	22"x46"	24"x48"	SUPPLY	DUCT	SIDEWALL GRILLE	DOUBLE DEFLECTION	TITUS 300FL	1,4,7
EG	0-1700	24"X24"	24"X24"	RETURN	CEILING	LAY-IN OR SURFACE	-	TITUS 23RS	1,3,4,5,7,8
EH	0-800	18"x18"	19 ³ / ₄ "x19 ³ / ₄ "	EXHAUST	DUCT	SIDEWALL GRILLE		TITUS 350FL	1,4,7
EI	0-700	18"x14"	$19\frac{3}{4}$ "x $15\frac{3}{4}$ "	EXHAUST	DUCT	SIDEWALL GRILLE	-	TITUS 350FL	1,4,7
EJ	0-500	14"x14"	15 ³ / ₄ "x15 ³ / ₄ "	EXHAUST	DUCT	SIDEWALL GRILLE	-	TITUS 350FL	1,4,7
EK	0-3350	22"x46"	24"x48"	EXHAUST	DUCT	SIDEWALL GRILLE	-	TITUS 350FL	1,4,7

2 REFERITS SOECHFICAERSISHALD BETAHESSFAMFASIZETASINALENFROECHASIZEI

3 PROVIDE 24"x24" LAY-IN BORDER

4 PROVIDE FACTORY POWDER COAT FINISH. COORDINATE FINAL COLOR WITH ARCHITECT/OWNER.

5 NC RATING NOT TO EXCEED 30 6 COORDINATE BLOW PATTERN WITH HVAC PLANS, USE BAFFLES FROM MANUFACTURER AS REQUIRED TO OBTAIN FLOW PATTERNS FOR 1-WAY, 2-WAY, AND 3-WAY

7 CONTRACTOR SHALL VERIFY QUANTITY OF DIFFUSERS, GRILLES, REGISTERS, ETC... REQUIRED. REFER TO PLANS.

8 PROVIDE ALUMINUM DIFFUSERS OR GRILLES IN LOCKER ROOMS AND BATHROOMS.

			RAW	EXI	HAUST
LOCATION	SUPPLY	RETURN	OUTDOOR AIR	WITH ENERGY RECOVERY	WITHOUT ENERGY RECOVERY
ATTIC TYPE SPACE (EXPOSED ROOF ABOVE)	R-8	R-8	R-4	R-8	R-8*
OUTDOORS	R-8	R-8	-0-	R-8	R-8*
CRAWL SPACE	R-6	R-6	R-6	R-6	-0-
UNCONDITIONED SPACE (SHAFT OR CEILING WITH DUCTED RETURN AIR)	R-6	R-6	R-6	R-6	-0-
RETURN AIR PLENUM	R-4	-0-	R-4	-0-	-0-
EXPOSED IN MECHANICAL ROOM	R-6	R-6	R-6	R-6	-0-
EXPOSED IN ZONE SERVED(**ONLY DUCTS THAT PROVIDE COOLING)	R-4**	-0-	R-4	-0-	-0-

OR LINING IS NEEDED.

DUCT LINING SCOPE: ACOUSTIC DUCT LINING OF THE TYPE AND THICKNESS SPECIFIED SHALL BE INSTALLED ON ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK WITHIN 20 FEET OF ALL TYPES OF AIR HANDLING UNITS (INCLUDING RTU, ERU, FCU, MUA, ETC., AND ALL BRANCHES WITHIN 20') ALL FANS (INCLUDING BRANCHES). ALL LOW PRESSURE DUCTWORK DOWNSTREAM OF ALL TYPES OF SUPPLY VOLUME BOXES (CV. VAV. FPVAV. ETC.), AND WHERE DETAILED OR SHOWN ON DRAWINGS. LINING SHALL NOT BE USED ON DUCTWORK SERVING SURGICAL SUITES, DELIVERY ROOMS, INTENSIVE CARE UNITS AND ISOLATION AREAS OF HOSPITALS AND MEDICAL FACILITIES OR ON KITCHEN AND FUME HOOD EXHAUST AND WET/HUMID EXHAUST SUCH AS DISHWASHER, CLOTHES DRYER, AND SHOWER SYSTEMS.

NOTES: (SEE SPECIFICATIONS FOR R-VALUES OF VARIOUS DUCT INSULATION AND LINERS).

1. R-VALUES SHOWN MAY BE OBTAINED BY ADDING THE R-VALUES OF BOTH THE LINING (WHERE SHOWN OR USED) AND EXTERNAL DUCT

2. R-VALUES SHOWN ARE AS INSTALLED. USE R-VALUES FOR 25% COMPRESSION FOR NON-RIGID INSULATION.

1 REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.

PIPE INSULATION (IECC - 2012 ASHRAE 90.1 -2010 COMPLIANCE)										
MINIMUM INSULATION THICKNESS IN INCHES FOR INDOOR PIPE SIZES (SEE NOTES BELOW)										
PIPING SYSTEM TYPES	FLUID TEMP. RANGE (°F)	< 1"	1" TO 11/4"	1½" TO 3"	4" TO 6"	8" AND UP	K-FACTOR (BTU-INCH/°F-HR-SF) AT AVE. TEMP. (°F)			
LOW TEMPERATURE HEATING	141 TO 200	1.5	1.5	2	2	2	0.25-0.28 @ 125°F			
CONDENSING BOILERS	105 TO 140	1	1	1.5	1.5	1.5	0.22-0.28 @ 100°F			

1. FOR MINIMUM THICKNESS OF ALTERNATIVE INSULATION TYPES OUTSIDE THE STATED CONDUCTIVITY RANGE. SEE TEST METHOD FOR STEADY STATE HEAT TRANSFER PROPERTIES OF HORIZONTAL PIPE INSULATIONS, ASTM C 335-95, AND THE STATE ENERGY CODE.

2. FOR OUTDOOR STEAM, HEATING WATER PIPING, ADD 50% TO THICKNESS LISTED.

3. REFER TO SPECIFICATIONS AND DETAILS FOR ADDITIONAL INFORMATION.

				LOU	VER AND	VENTILA	ATOR SCHEDULE		
TAG	LOCATION	DII	MENSI	ONS	- MOUNTING	FREE AREA	MANUFACTURER AND MODEL NUMBER	REMARKS	
		W	Н	D		(SQFT)	(AS STANDARD)		
LV-1	MECH ROOM	24"	24"	34.75"	ROOF	11.14	GREENHECK WRH	1,2,3	
LV-2	SPRINKLER ROOM	24"	24"	34.75"	ROOF	11.14	GREENHECK WRH	1,2,3	
LV-3	PARTS WASHER	24"	24"	34.75"	ROOF	11.14	GREENHECK WRH	1,2,3	
LV-4	PAINT BOOTH HALL	48"	48"	6"	WALL	8.32	GREENHECK EDJ-601 SERIES	1,2,3	
LV-5	PAINT STORAGE .	36"	36"	34.75"	ROOF	15.86	GREENHECK WRH	1,2,3	
LV-6	PAINT STORAGE	18"	18"	12.25	ROOF	3.19	GREENHECK WRH	1,2,3	
LV-7	VARIES	24"	24"	6"	WALL	1.84	GREENHECK EDJ-601 SERIES	1,3	
LV-8	MEZZ. LOUVER	102"	120"	6"	WALL	50.14	GREENHECK EDJ-601 SERIES	1,3	
LV-9	MEZZ LOUVER	108"	120"	6"	WALL	54.31	GREENHECK EDJ-601 SERIES	1,3	
LV-10	PAINT MECH PLAT.	166"	75"	6"	WALL	49.53	GREENHECK EDJ-601 SERIES	1,3	
NOTES:	1	1	1	1	1		1	1	

1 REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION. 2 PROVIDE WITH ACTUATOR AND RUSKIN CD51 LOW-LEAKAGE CD51 TYPE DAMPER OR APPROVED EQUAL 3 PROVIDE WITH BIRD AND INSECT SCREEN

	TERMINAL VOLUME BOX SCHEDULE												
TAG	TYPE	SELECTION	INLET SIZE	DISCHARGE SIZE (IN.)		MAX. S.P. DROP W/	NC RA	TING	MANUFACTURER AND MODEL NUMBER	REMARKS			
IAG	TYPE	RANGE (CFM)	(IN.)	W	Н	COIL (IN.WG)	RAD	DISCH	(AS STANDARD)	KLIWAKKO			
VAV-6	SINGLE DUCT	60-500	6	11.5	9.5	0.11	23	20	TRANE VCW SERIES	1 THRU 3			
VAV-8	SINGLE DUCT	105-900	8	12.5	11.5	0.10	23	16	TRANE VCW SERIES	1 THRU 3			
VAV-10	SINGLE DUCT	165-1400	10	15.5	13.5	0.25	22	23	TRANE VCW SERIES	1 THRU 3			
VAV-12	SINGLE DUCT	240-2000	12	19.5	15.5	0.5	23	27	TRANE VCW SERIES	1 THRU 3			

NOTES:

WITH CO2 CONTROLS, IN WHICH CASE 75% OF MAXIMUM

1	REFER TO SPECIFICATIONS, AND DETAILS FOR ADDITIONAL INFORMATION.
2	PROVIDE PRESSURE SWITCH TO PROVE AIRFLOW.

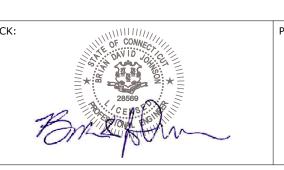
3 COIL HEATING CAPACITY SHALL BE BASED ON MINIMUM CFM AND WATER FLOW LISTED ON DRAWINGS FOR EACH BOX (EXCEPT FOR BOXES AIR FLOW SHALL BE USED).

							HOT V	VATER	HEAT	ING COIL	SCHEE	DULE				(GPM	
			SIZE (IN.)		FACE		FINS	AIR DATA			WATER DATA				MANUFACTURER AND MODEL		
TAG	CFM O	OUTPUT (MB	UТРUТ (MB	H) W	Н	VELOCITY (FPM)	ROWS	PER FOOT	EAT (°F)	LAT (°F)	P.D. (IN.WG)	GPM	EWT (°F)	LWT (°F)	P.D. (FT.)	NUMBER (AS STANDARD)	REMARKS
HC-1	7200	273.29	70	21	705	2	149	55	90	0.35	18.26	140	110	1.29	TRANE HTCL D5WB21	1,2	

1 REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION. 2 PROVIDE WITH PRESSURE INDEPENDENT CONTROL VALVE.

1	EXPANSION TANK SCHEDULE														
TAG	SERVICE	LOCATION	TYPE	FLUID	SYSTEM TEMP (°F)		SYSTEM PRESSURE (PSIG) AT TANK		VOLUME (GALLONS)		DIMENSIONS		INITIAL TANK AIR CHARGE	MANUFACTURER AND MODEL NUMBER	REMARKS
						MIN N	MAX	MIN	MAX	TANK	ACCEPTANCE	DIA	Н	(PSIG)	(AS STANDARD)
ET-1	HEATING WATER	MECH RM	FULL ACCEPTANCE	H20	90	140	20	40	132	.366	24	86	20	TACO CA500-125	1

			THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.	DESIGNER/DRAFTER WJS CHECKED BY: TFC SCALE	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION
۱O.	Revision Description	Date	Plotted: 10/21/2014 3:32:11 PM	1/8" = 1'-0"	File Name: MPFP CTDOT Rocky Hill Repair Facility Central.rvt



REPAIR FACILITY

ROCKY HILL

118-0167 DRAWING NO. **MEC-701**

10.39

1 REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.

UNIT HEATER (UH) AND CABINET UNIT HEATER (CUH) SCHEDULE (HOT WATER)

ELECTRIC SERVICE

2.6 | 208 | 3

208

208

208

208

208

208

208

208

208

208

208

208

208

208

208

208

208

208

208

208

208

208

208

208

208

2.6 208 3

BTUH

/FT AT

1120

360

FINNED TUBE RADIATOR SCHEDULE

LENGTH

2.6 208

AMPS

2.6

2.6

2.6

2.6

2.6

2.6

2.6

2.6

2.6

2.6

2.6

2.6

2.6

2.6

2.6

2.6

1.4

2.6

2.6

2.6

2.6

2.6

HORIZ | 153.9 | 5500 | 0 | 105 | 1075 | $\frac{1}{2}$ | 2.6 | 208 | 3 | H20 | 15.6 | 140 | 110 | 0.85

FLUID

H20

TYPE

SLOPE-

TOP

TOP

TOP

TOP

TOP

TOP

TOP

TOP

3-5/8"

15.6

15.6

15.6

15.6

15.6

15.6

15.6

15.6

15.6

15.6

15.6

15.6

15.6

15.6

15.6

15.6

15.6

140

140

15.6 | 140 | 110 | 0.85

OUTPUT

MBH

153.9

153.9

153.9

153.9

153.9

153.9

153.9

153.9

153.9

153.9

153.9

153.9

153.9

153.9

153.9

153.9

153.9

153.9

153.9

153.9

153.9

1 REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.

TYPE | SIZE | TYPE

FTR-1 140 110 COP. $\frac{3}{4}$ ALUM. $4\frac{1}{4}$ X4 $\frac{1}{4}$ 50 2

FTR-2 | 140 | 110 | COP. | $\frac{3}{4}$ | ALUM. | $4\frac{1}{4}$ "X4 $\frac{1}{4}$ "

FTR-4 140 110 COP. $\frac{3}{4}$ ALUM. $3\frac{1}{4}$ "X2 $\frac{3}{4}$ "

FTR-5 | 140 | 110 | COP. | $\frac{3}{4}$ " | ALUM. | $3\frac{1}{4}$ "X2 $\frac{3}{4}$ "

FTR-6 | 140 | 110 | COP. | $\frac{3}{4}$ " | ALUM. | $3\frac{1}{4}$ "X2 $\frac{3}{4}$ "

FTR-7 | 140 | 110 | COP. | $\frac{3}{4}$ " | ALUM. | $3\frac{1}{4}$ "X2 $\frac{3}{4}$ "

FTR-8 | 140 | 110 | COP. | $\frac{3}{4}$ " | ALUM. | $3\frac{1}{4}$ "X2 $\frac{3}{4}$ "

FTR-9 140 110 COP. $\frac{3}{4}$ ALUM. $3\frac{1}{4}$ "X2 $\frac{3}{4}$ "

FTR-10 | 140 | 110 | COP. | $\frac{3}{4}$ " | ALUM. | $3\frac{1}{4}$ "X2 $\frac{3}{4}$ "

FTR-12 | 140 | 110 | COP. | $\frac{3}{4}$ " | ALUM. | $3\frac{1}{4}$ "X2 $\frac{3}{4}$ "

FTR-13 | 140 | 110 | COP. | $\frac{3}{4}$ " | ALUM. | $3\frac{1}{4}$ "X2 $\frac{3}{4}$ "

FTR-14 | 140 | 110 | COP. | $\frac{3}{4}$ " | ALUM. | $3\frac{1}{4}$ "X2 $\frac{3}{4}$ "

FTR-15 | 140 | 110 | COP. | $\frac{3}{4}$ | ALUM. | $3\frac{1}{4}$ "X2 $\frac{3}{4}$ "

3 PROVIDE FULLY ADJUSTABLE AIR DEFLECTORS AND OSHA APPROVED FAN GUARD.

EAT

5500

5500

5500

5500

5500

5500

5500

5500

5500

5500

5500

5500

5500

5500

5500

5500

5500

LAT

0 105 1075

1075

1075

1075

1075

1075

1075

1075

1075

1075

1075

FINS

/FT

HIGH

105

105

105

105

105

105

105

105

105

105

105

105

105

105

105

103

105

105

103

103

105

105

105

5500 0 105 1075

2 PROVIDE MINIMUM OF 20 GAUGE STEEL CASING PAINTED WITH A CORROSION RESISTANT, BAKED, POLYESTER POWDER COATED FINISH.

SIZE

105 1075

105 1075

TYPE

HORIZ

HORIZ

HORIZ

HORI7

HORI7

HORI7

HORIZ

HORIZ

HORIZ

HORIZ

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HORI7

HORIZ

HORIZ

HORI7

HORIZ

HORIZ

HORIZ

HORIZ

HORIZ

TAG

UH-1

UH-2

UH-3

UH-4

UH-5

UH-6

UH-7

UH-8

UH-9

UH-10

UH-11

UH-12

UH-13

UH-14

UH-15

UH-16

UH-17

UH-18

UH-19

UH-20

UH-21

UH-22

UH-23

UH-24

UH-25

UH-26

UH-27

UH-28

UH-29

UH-30

UH-31

UH-32

LOCATION

CNG BAY

CNG BAY

CNG BAY

RFPAIR BAY

RFPAIR BAY

RFPAIR BAY

RFPAIR BAY

WELD SHOP

WELD SHOP

REPAIR BAY

RFPAIR BAY

LUBE BAY

LUBE BAY

LUBE BAY

LUBE STORAGE

WASH BAY

STORES STOCK

STORES STOCK

STORES STOCK

FLECTRIC RM

SPRINKLER RM

MACHINE SHOP

MACHINE SHOP

PARTS WASH

PAINT STORAGE

PAINT BAYS

WELD/FAB SHOP

WELD/FAB SHOP

WELD/FAB SHOP

AERIAL BUCKET

AERIAL BUCKET

MECH PLATFORM

6 PROVIDE AS EXPLOSION PROOF

4 PROVIDE ALUMINUM FINS AND COPPER TUBE COILS.

WATER TEMP.

(°F) (°F)

5 PROVIDE FACTORY WALL MOUNTED THERMOSTAT.

MANUFACTURER AND

(AS STANDARD)

TRANE S-360 SERIES

TRANE S-36 SERIES

TRANE S-360 SERIES

TRANE S-360 SERIES

TRANE S-360 SERIES

TRANE S-360 SERIES

TRANE S-36 SERIES

TRANE S-24 SERIES

TRANE S-360 SERIES

TRANE S-360 SERIES

TRANE S-24 SERIES

TRANE S-36 SERIES

TRANE S-48 SERIES

TRANE S-360 SERIES

MANUFACTURER AND MODEL NUMBER (AS

STANDARD)

MODINE S-18

MODINE SP-8

REMARKS

1 THRU 6

1 THRU 6

1 THRU 6

1 THRU 5

REMARKS

MODEL NUMBER

EWT LWT P.D.

140 | 110 | 0.85

140 | 110 | 0.85

| 140 | 110 | 0.85

140 | 110 | 0.85

140 | 110 | 0.85

140 | 110 | 0.85

140 | 110 | 0.85

140 | 110 | 0.85

| 140 | 110 | 0.85

140 | 110 | 0.85

140 | 110 | 0.85

15.6 | 140 | 110 | 0.85

DEPTH HEIGHT

5-1/4" 18"

110 0.85

110 0.09

110 0.85

110 | 0.09

110 0.85

110 | 0.09

110 0.85

110 0.85

0.85

0.85

0.85

(°F) (°F)

15.6 | 140 | 110 | 0.85

MECHANICAL SCHEDULES II